HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL AIR CONDITIONING, REFRIGERATION, AIR SANITATION, PIPING, HEATING AND VENTILATION

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Advertising Representatives

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148 Lafayette Street
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THIS MONTH'S COVER

Jones & Laughlin Steel Corp. photo emphasizes heat and humidity developed in some industrial environments. For control of such conditions, see the article beginning page 61.

First National Bank Building, Detroit, cuts heating and cooling load with Air Recovery Equipment.

Saves 108 tons of coal; 1,959,075 pounds of steam.

Air Recovery Equipment, employing activated carbon to adsorb airborne gaseous and vaporous impurities, is installed in existing system and 20,000 CFM of stale, contaminated air that had been exhausted is economically restored to original freshness and recirculated.

Estimated fuel savings surpassed before end of season.

WHEN Merle F. Bennett, Chief Engineer of the First National Bank Building in Detroit, checked fuel consumption at the end of February, he found that he had already saved more than the 100 tons of coal it had been estimated he would save with Air Recovery Equipment for the entire heating season.

In his report, he submitted the following figures:

"Fuel consumption September to February inclusive:

	Total consumption (lbs. of steam)	Degree days	Lbs. per degree day
1943-44	29,467,100	4659	6325
1944-45	29,406,600	4959	5930

"Applying last year's 6,325 pounds per degree day to this year's degree days (6,325 x 4,959), we get 31,365,675 pounds, which is the amount of steam we would have consumed this year if we were operating under last year's conditions, without the Air Recovery Equipment.

"Comparing that consumption with this year's actual:

31,365,675 pounds — consumption estimated on last year's efficiency
29,406,600 pounds — 1944-45 actual consumption

1,959,075 pounds — saved or approximately 108 tons of coal (13,000 B.T.U. coal at 70% efficiency)"

Refrigeration equipment saved by expanding capacity of plant.

The savings for the cooling season will be reflected not only in electrical energy (estimated at 36,000 KW hours), but in equipment as well. Last year the refrigeration plant had been unable to meet requirements. Internal air contamination from added personnel and customer service had increased until it was necessary at times to bring in a maximum amount of outdoor air for dilution purposes. The load resulting from cooling all that new air overtaxed the refrigeration equipment to a point where additional equipment was needed.

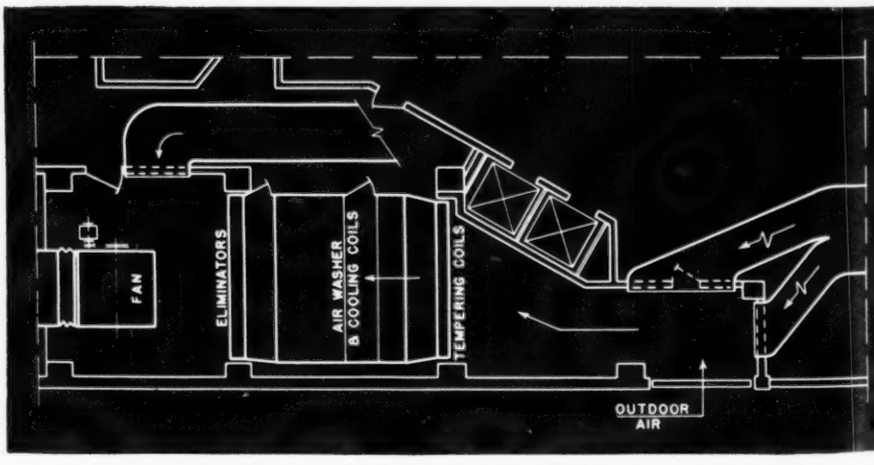
But the Air Recovery Equipment offered another solution —that of expanding the capacity of the existing plant. At the same time it eliminated another difficulty. The outdoor air intake, located at the fourth floor level, is in a pocketed space directly across from kitchen vent stacks of restaurants in neighboring buildings. Under certain wind conditions, befouling odors and other vaporous contaminants polluted the air drawn into the building.

How DOREX Air Recovery Equipment solved the problem.

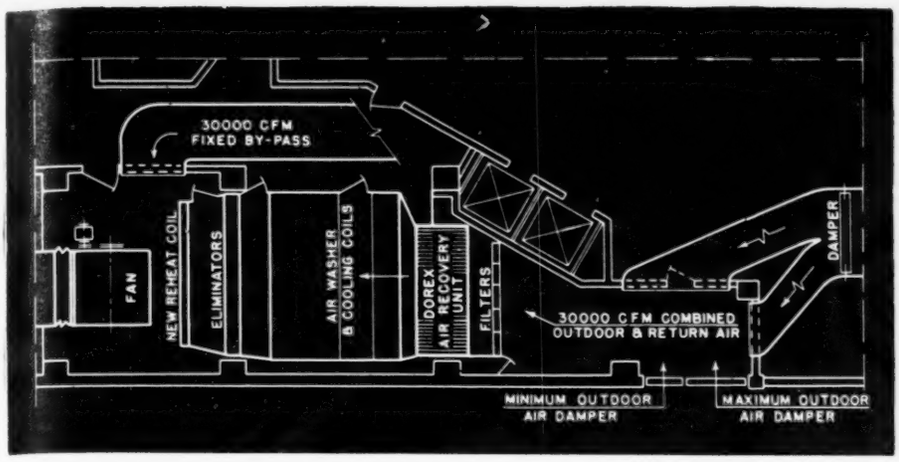
Enough activated carbon canisters were installed to remove the gaseous and vaporous impurities from 30,000 CFM at a point in the system where 20,000 CFM of return air and 10,000 CFM of new outdoor air could be purified. This cut the load on the heating and cooling facilities by conserving the favorable thermal values of the recirculated air and applied positive odor elimination to both.

Under actual operating conditions, it was found that the 10,000 CFM of outdoor air was more than enough for oxygen and internal static pressure requirements and the total 30,000 CFM of purified air increased the quality of indoor air because of its greater diluting properties.

We will be glad to send you the details of other typical installations, or estimate the savings on any case of your own. Drop us a line or call our district representative.



NO. 1 BEFORE SAVINGS: First National Bank Building Equipment roo
The air circulating system with a fan capacity of 60,000 CFM serves the gene banking area, general office space and private offices.

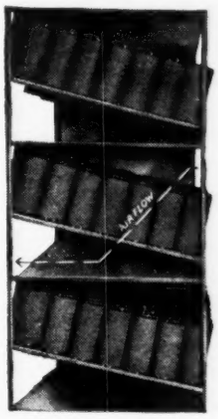


NO. 2 AFTER SAVINGS: The same equipment room after the DOREX Air Recovery Equipment was installed. Through the addition of thermostatic control on the dampers, the relative proportions of outdoor air and recirculated air are automatically regulated so that a maximum amount of outdoor air is used during the mild weather and a minimum during extremes of hot or cold weather.

Air Recovery Equipment is paying its way in the following successful applications:

Airplanes — Institutions
Chemical Laboratories
Banks — Libraries
Breweries — Locker Plants
Department and Retail Stores
Busses — Office Buildings
Oil Companies — Railroad Cars
Precision Instrument Mfg.
Film Manufacturing Plants
Food Processing Plants — Restaurants
Hospitals — Sewage Plants
Hotels — Telephone Exchanges
Industrial Plants — Theaters

DOREX Type H Canister Unit Installed.



Added resistance averages only .015" water gauge.

This unit consists of removable, perforated canisters filled with activated carbon and mounted on manifold plates. The assembly is so arranged that all air to be treated passes uniformly through the granular carbon which extracts all air-entrained gaseous and vaporous impurities. Erection and assembly of the unit are simple and easy. And, while the service life of DOREX Absorbers is directly relative to the odor concentration encountered, experience shows that, in average comfort conditioning applications, two years' life or more may be expected between reactivations.

Works like a gas mask.

Nothing is added to the air. Vaporous and gaseous contaminants are removed, not disguised.

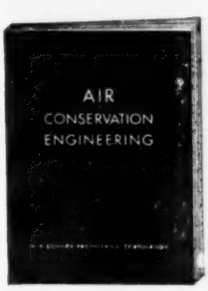
Contaminated air passed through the special gas adsorbing carbon used in Dorex Equipment, emerges purer by far than the outdoor air of inhabited communities. Activated carbon is the most powerful adsorption material known. It has been used for many years in industry for the recovery of chemicals in gaseous and vaporous form. Thousands of current applications demonstrate its ability to adsorb the air-borne contaminants that make air stale and odorous in commercial, industrial or public-assembly installations. Impurities—from occupants and their habits (body, apparel, respiratory, tobacco, and cosmetic emanations); from liquor and food in preparation and cooking; from lubricating oils, solvents, etc., in industrial processes—*all* can be extracted from the air by adsorption.

Engineering Help Available.

The W. B. Connor Engineering Corporation maintains a research laboratory, a staff of trained specialists, and district representatives in leading cities whose services are at the disposal of Consulting Engineers, Architects, Air Conditioning Equipment Distributors and Plant Engineers. Our staff can assist you in figuring out the economies and mechanics of air conditioning load reduction through Air Recovery, or help you apply the sound advantages of Air Purification to any manufacturing operation, where contaminated air threatens product quality or production efficiency.

Air Conservation Engineering.

A limited number of copies of our new textbook containing complete information on the economics, the functions and the mechanics of Air Recovery are available. It will help you figure requirements for a wide variety of uses. Contains technical data needed in designing most applications. Cites actual cases and describes advantages of Air Recovery to Design Engineers, Architects, Plant Engineers and Contractors. Copies are $2.00 each. Complimentary copies are available to Registered Architects and Recognized Engineers on request.



For full information and quotations on DOREX Equipment, call the nearest District Representative or write Dept. D-5, 112 East 32nd Street, New York 16, N. Y.

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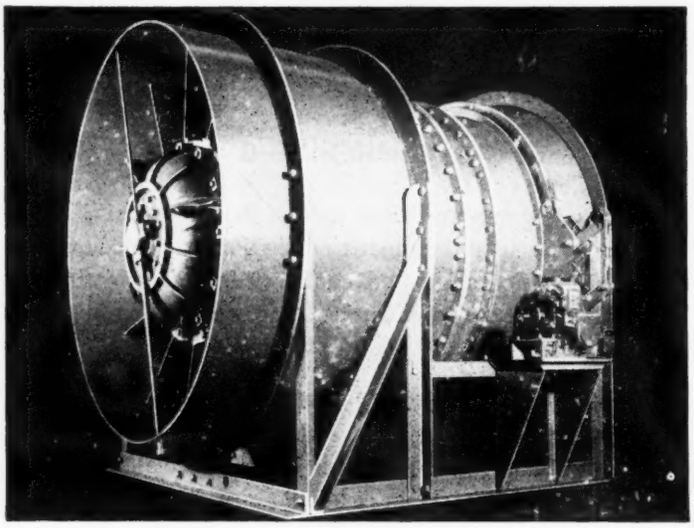

Giant "Buffalo" Axial Flow Fan in use for aircraft engine testing.

AXIAL FLOW DESIGN *Eliminates* WASTE AIR TURBULENCE

NOT THIS

BUT THIS

"Buffalo" Axial Flow Fan for industrial use. Many applications are possible with these fans.

Smooth, quiet, economical delivery of air . . . that's the result "Buffalo" axial flow fan design! Air follows the straight line fro inlet to discharge minus noisy, wasteful turbulence.

Stationary vanes at the inlet in this proven "Buffalo" desi cancel-out the rotary motion of the fan . . . saving power, b delivering a strong, straight column of air with minimum resi ance. Precision balancing and rugged construction, too, a in every fan to leave our shops.

Consultation with an experienced Buffalo representative w enable you to select "Buffalo" ventilation tailor-made f your particular air problem.

Yours! Write for this new booklet with full data on "Buffalo" Axial Flow Fans.

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Dry-Ex Water cooler

ACME dry expansion water coolers are designed especially to meet the increasing demand for cooled recirculated water in air conditioning systems of the indirect type, and for processing water in large volume. Shell and baffled tube construction. They require but a small refrigerant charge and refrigerant loss risk is reduced to a minimum . . . Thermostatic expansion valves simplify refrigerant control. Positive oil return with refrigerant vapor...free from the usual oil troubles of "dry compressors" and "oil logging" of evaporators. They are non-freeze.

They are today supplying excellent service in hundreds of installations. A full range of capacities. The Dry-Ex Cooler is also recommended for cooling ethylene and propylene glycols, alcohols, calcium chloride brine and other liquid coolants.

HI-PEAK WATER COOLERS

● Where instantaneous high-peak delivery of cooled water is desired, Acme remote type water coolers assure ample reserve volume on demand at all times. Shell and coil construction hotdip galvanized after fabrication. Coils are properly sized to insure against excessive refrigerant pressure drop. Sweat fittings are silver soldered. All pipe connections are welded to shell. Storage capacities: 12 to 168 gallons . . . Write for Catalog No. 25.

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Evaporative Condensers
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Heat Exchangers • Oil Separators
Pipe Coils • Liquid Receivers
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Heat Interchangers

Want to simplif

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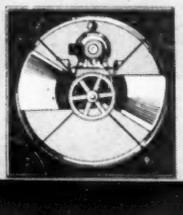
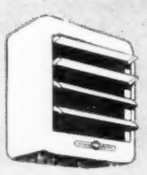
Herman Nelson unit heaters, unit ventilators, propeller fans, centrifugal fans and unit blowers have been designed and constructed for maximum operating efficiency and economy by a firm recognized as a leader in the heating and ventilating industry for the past 38 years.

The Herman Nelson Distributor nearest you has a trained organization, ready to provide practical as well as technical information in the selection of the exact type and size of equipment best suited for each job. Thoroughly familiar with Herman Nelson Products and their application, the Distributor will help you hold costs down to a minimum while your customers will obtain the superior results they have a right to expect from this quality heating and ventilating equipment.

Herman Nelson Direct Drive Propeller Fans

Herman Nelson Belt Drive Propeller Fans





Herman Nelson Horizontal Shaft Propeller-Fan Type Unit Heaters

Herman Nelson Type H Centrifugal Fans

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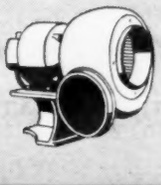
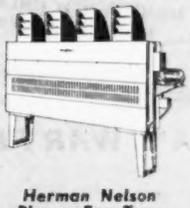
Herman Nelson Belt Drive Unit Blowers

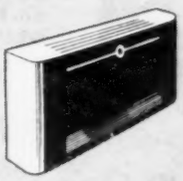
Herman Nelson Direct Drive Unit Blowers





Herman Nelson Blower-Fan Type Unit Heaters

Herman Nelson De Luxe Unit Heaters



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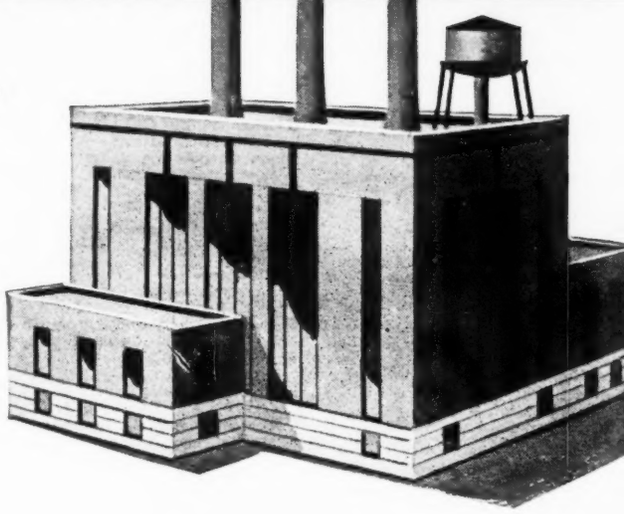

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Every dime saved grows into dollars . . . and dollars into impressive total amounts.

Such savings are entirely possible through the installation of the *right* Todd Burners, which can save you 10¢ out of every dollar spent for oil or gas, in production of power and heat.

At the same time Todd Oil and Gas Burners give you efficient automatic control, adjustable to your power needs, and appreciably increase your power output.

Result: *Reduced cost per pound of steam* leading to lessened operating costs and total plant overhead.

Todd for thirty years has supplied the world with efficiency-tested liquid and gaseous combustion equipment; today there is available to you a *complete* line of *completely* modern Todd Burners, rightly adapted for all power and heat uses in the industrial, commercial and marine fields.

Summon a Todd trained engineer. He'll be glad to go over your specifications with you and explain how modernization with Todd will save you money.

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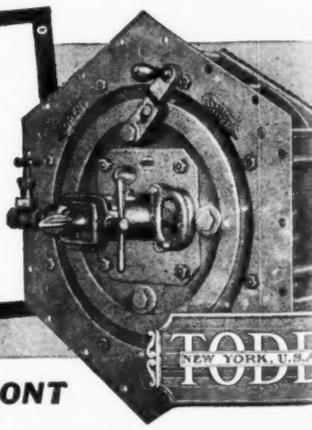

ON THE FIRING LINE OF AMERICA'S WAR PRODUCTION FRONT

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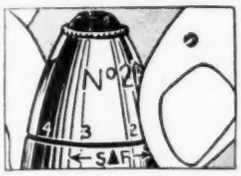
"Hoffman Vacuum Valves are keeping me more comfortable on ⅓ less fuel"

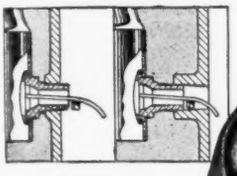
HOW TO MAKE FRIENDS AND MONEY

. . . at the same time



ADJUSTABLE VENT PORT

The Hoffman vent port adjustment provides a smoothly graduated rate of venting in *direct proportion* to the adjustment number. It can be adjusted to prevent waterlogging, spitting and rumbling.



NEW, IMPROVED HINGED TONGUE

The Hoffman Hinged Drainage Tongue construction adapts itself to radiators equipped with various boss lengths. It assures good drainage under all conditions of service. An exclusive Hoffman feature.

Showing a home owner how to have even greater comfort in spite of a reduced fuel supply is certainly a sure way to make a friend. If at the same time you make a profit on your good work, that's a successful deal all around. He saves money and protects his comfort—you make money—everybody's happy.

This is exactly the job Hoffman Valves will do for you today! They effectively remedy the conditions which cause discomfort and fuel waste.

In selecting valves to meet modern firing conditions, the main consideration is to obtain an adjustment of venting rates which will enable all radiators to heat equally and at the same time. Hoffman Valves accomplish this purpose admirably . . . *because they are equipped with a properly designed venting adjustment.*

The venting requirements of both gravity and vacuum steam heating systems are fully covered by the Hoffman line of radiator and main vents. In anticipation of a heavy demand this fall, we suggest that you order a representative stock from your jobber now.

HOFFMAN ADVERTISING REACHES MILLIONS

As usual, Hoffman Valves will be advertised this heating season in nationally circulated magazines. Interest in home modernization is at a peak, with plenty of money to support it. So climb on the Hoffman bandwagon now—we've got the valves—you've got the prospects.

Send for Hoffman Vent Valve Catalog offering the most complete line of steam heating specialties.

HOFFMAN VENT VALVES

HOFFMAN SPECIALTY CO., 1001 YORK ST., DEPT. HV-8 INDIANAPOLIS 7, IND. MAKERS OF VALVES, TRAPS, HOT WATER HEATING SYSTEMS, VACUUM AND CONDENSATION PUMPS . . . SOLD BY LEADING WHOLESALERS OF HEATING AND PLUMBING EQUIPMENT.

Controlled Heating

STEAM HOT WATER

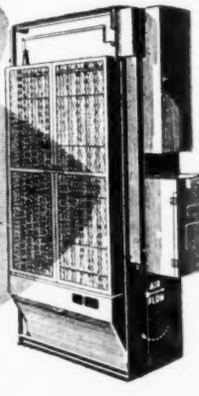
—can be duplicated in many industrial plants

PROVIDING SUPER CLEAN AIR for dial stations where automatic telephone switch board equipment operates, is a job made to order for AAF Electronic Air Filters—and they are performing this exacting service, with complete satisfaction, in cities throughout the country. The same clean air requirements are present in many industries today where materials in process must be protected against spoilage by dust, soot or smoke and where worker efficiency is impaired by air contamination. AAF has developed the first complete line of Electronic Air Filters, making super clean air available for every industrial and commercial need. Write for copy of booklet "The Magic of Electronics in Air Filtration" just off the press.

AMERICAN AIR FILTER COMPANY, INC.
Incorporated
294 Central Avenue, Louisville 8, Ky.
In Canada, Darling Bros., Ltd., Montreal, P. Q.

AAF

Electro-matic



THE ELECTRONIC AIR FILTER

HAVE YOU TRIED ILG *FLOATED DRIVE?*

Simple, compact arrangement of ILG direct-connected motor and wheel unit with "Floated Drive".

Motor and Wheel "ride in rubber" for effective, low-cost sound isolation!

Extremely quiet operation is yours with ILG patented "floated drive"! This tried and proved ILG development eliminates metal-to-metal contact, isolates sound and vibration *at point of origin*, prevents noise amplification by fan housing. Four point vertical floating of the weight takes advantage of all three loading factors—compression, tension and shear—providing utmost dampening effect. Motor and wheel are isolated as a single unit. Unbalanced cushioning is impossible. Cost is low—installation is quick and simple—results are highly satisfactory. Can be mounted at any time on Centrifugal Fans. Write us or call nearby Branch Office (consult classified directory) for complete information.

ILG

VITALIZED VENTILATION

AND AIR CONDITIONING

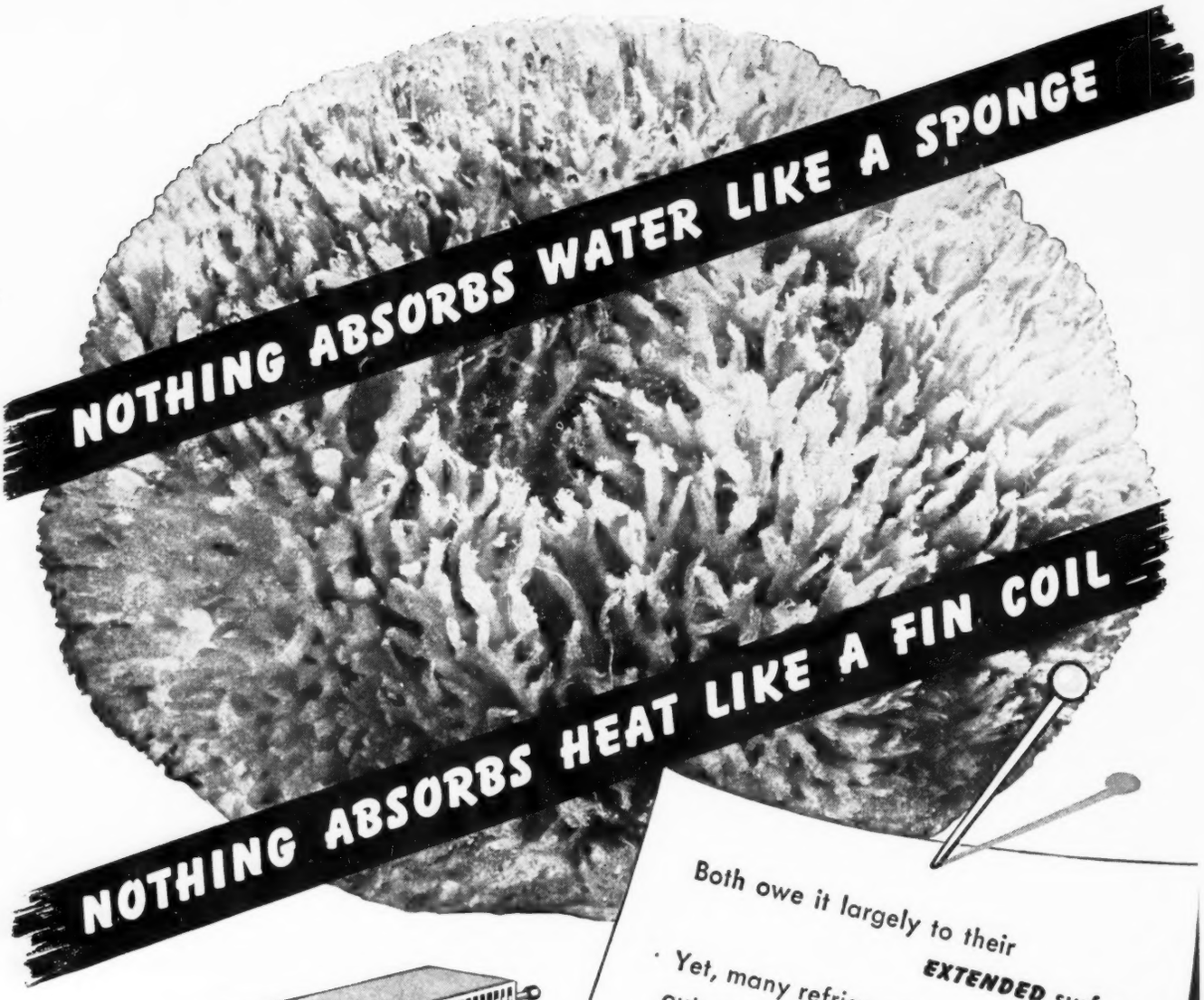
FREE!

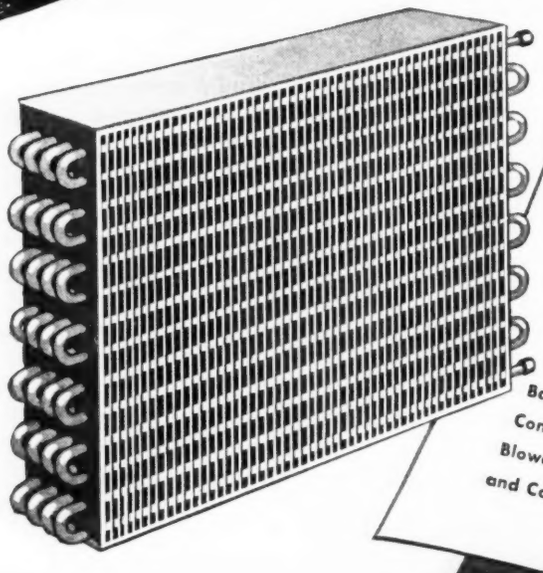
88-page book on solutions to ventilating problems.

WANTED: GRADUATE ENGINEERS!

for ILG Branch Offices, Research, Engineering Depts. Exceptional opportunities now and post-war for graduates of accredited technical schools. Send details on education, experience, health, age, marital status.

ILG ELECTRIC VENTILATING CO., 2838 N. Crawford Avenue, Chicago 41, Ill.
Offices in 40 Principal Cities





Both owe it largely to their **EXTENDED** surface.

Yet, many refrigeration systems still use outmoded bare-pipe coils. It will pay you to install modern MARLO Fin Coils for:

Greater efficiency • Smaller size
• Lighter weight • Lower cost

May we send you our Blast Coil Bulletin?

MARLO
HEAT TRANSFER SURFACE

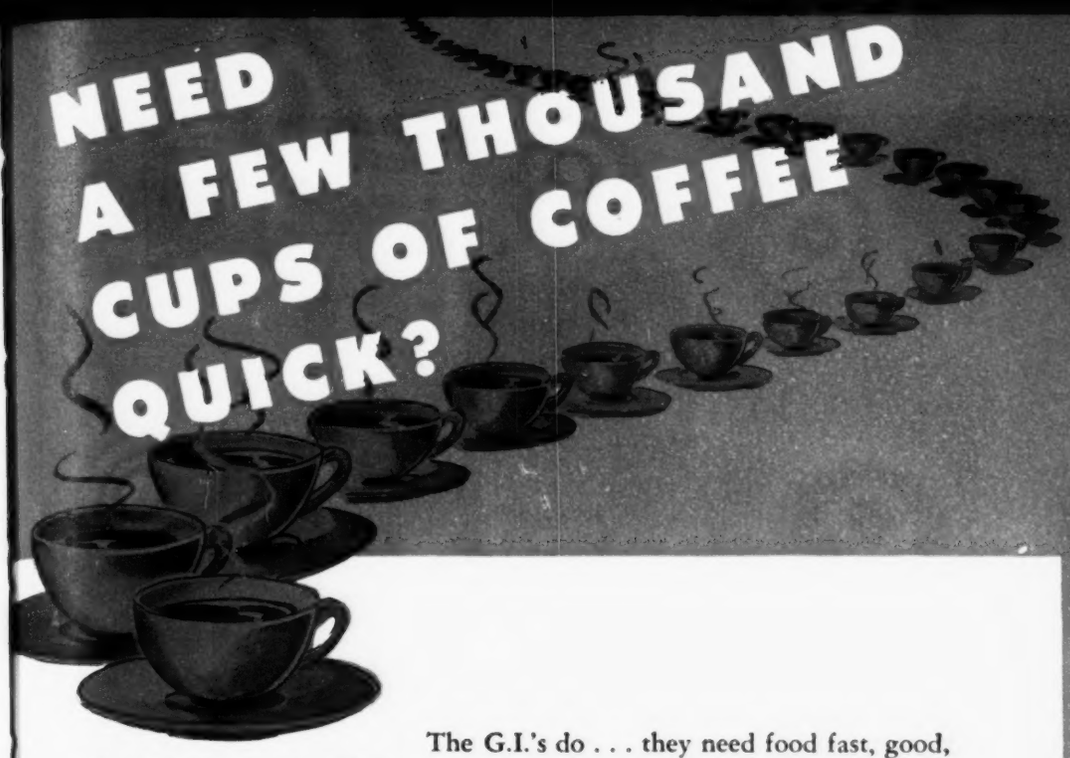
Ball-Bonded Blast Coils—Cooling and Heating • Air Conditioning and Refrigeration Apparatus • Industrial Blower Units • Unit Coolers • Evaporative Condensers and Coolers • Low Temperature Apparatus

"MARLO MEANS HEAT TRANSFER EQUIPMENT"

MARLO COIL COMPANY

ST. LOUIS 10, MISSOURI

NEED A FEW THOUSAND CUPS OF COFFEE QUICK?



THESE *Parker* KETTLES CAN REALLY TURN OUT THE CHOW—

● A 100 gal. Parker gas-fired steam jacketed kettle with agitator. Note the McDonnell Boiler Water Level Control.

● Parker 40 to 55 gal. gas-fired steam jacketed coffee urn, equipped with McDonnell water feeder (not visible in photo).

● Another type of gas-fired McDonnell equipped kettle. Parker kettles and urns are widely used in food processing plants, chemical plants, milk plants, etc.

The G.I.'s do . . . they need food fast, good, and in big quantities. Their requirements for thousands of cups of coffee, thousands of portions of stew, cooked vegetables and the like, are being turned out on a high speed, mass production schedule by batteries of steam jacketed kettles like these at camps and bases here and in lands beyond the seas.

The kettles illustrated are made by Royce L. Parker, Inc. of Bellwood, Illinois. Each kettle of the size used by the armed forces takes care of about 250 healthy, hungry G.I.'s. The kettles and urns are fully steam jacketed and gas-fired (often with bottled gas) to generate their own steam . . . some electrically heated for camps and bases where current is readily available.

It would be a tough job to maintain the water level in a flashy unit like this by manual feeding, and it would be disastrous to lose the water line. So every Parker kettle is equipped with a McDonnell No. 47 water feeder—the device that never forgets to keep the water level where it belongs. As a matter of fact the Parker organization insists on a McDonnell Water Level Control on all gas and electric steam jacketed kettles, whether supplied to the armed forces or to the food processing plants, meat packing industry, drug, or other fields where Parker equipment is used. In the words of Royce L. Parker, "The insurance companies require water level control, but even if this were not the case, we would insist on it to satisfy our own standards of absolute safety."

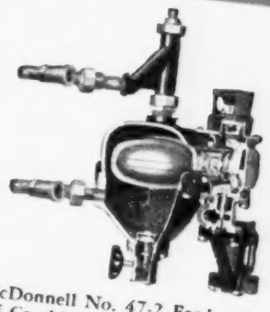
Yes, an army "travels on its stomach" so, naturally, these Parker units, and the water feeders we make for them, are on the "right-now" list. In fact, there have been a lot of these wartime "right-now" requirements heaped upon us—feeders and cut-offs for water distillation units, portable water heaters, package power plants and so on . . . so many of them that even orders carrying high ratings have had to wait.

We are citing these examples of critical wartime needs to show some of you folks who are chaffing over delays that we can control water level far better than we can control conditions!

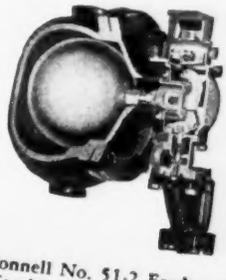
McDONNELL & MILLER, *Inc.*, 1313 Wrigley Building, Chicago 11, Illinois

Doing One Thing Well

REG. U. S. PAT. OFF. SAFETY CONTROL



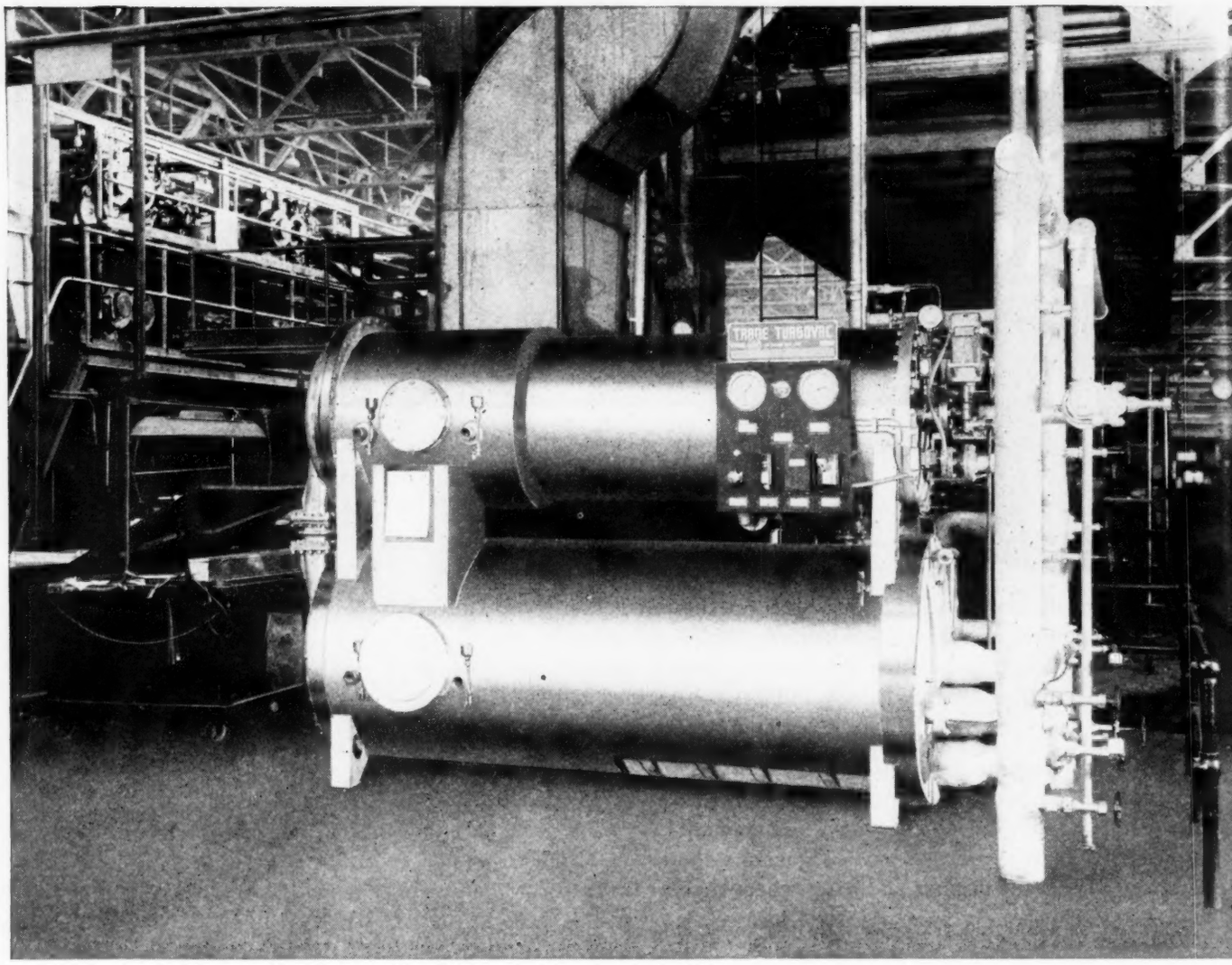
McDonnell No. 47-2 Feeder Cut-off Combination. The most widely used and proved combined boiler water feeder and low water cut-off for automatically fired boilers with capacities up to 5000 sq. ft., maximum steam pressure, 25 lbs. It may also be used without the low water cut-off switch for hand fired boilers.



McDonnell No. 51-2 Feeder Cut-off Combination. The No. 51-2 takes care of the automatically fired boilers above 5000 sq. ft. capacity, maximum steam pressure, 35 lbs. It may also be used without switch for hand fired boilers.

McDONNELL

BOILER WATER FEEDERS • LOW WATER CUT-OFFS



HOW TRANE EQUIPMENT IS COOLING *HOT PAPER*

At the W. F. Hall Printing Company, Chicago, mammoth rotary presses print four superimposed colors on both sides of a web of paper traveling at high speed.

To eliminate smearing or smudging at maximum operating speeds it was necessary to install a gas drying oven which operated at 1500°. However, this raised the temperature of the paper to a point where it was no longer possible to maintain a high standard of accurate color register.

The problem was solved by installing two 70-ton Trane Turbo-vacuum compressors to cool the paper to normal room temperature . . . accomplished by supplying chilled water from the versatile Trane Turbo-vacuum compressors to rolls, around which the heated paper passed after the drying operation. These water cooled rolls restored the paper to the normal temperature necessary for the extremely accurate color register.

This is just another case where Trane, manufactu
ing engineers of cooling, heating and air handlin
equipment, has been called upon to solve an unusu
problem in industry.

For the architects, engineers, contractors, builders
America who are planning today for tomorrow's buil
ing and processing, Trane has the products, the know
edge, and the production facilities. When you have
cooling problem, whether for comfort or process, ca
on Trane first.

TRANE

THE TRANE COMPANY LA CROSSE, WISCONSIN

TRANE COMPANY OF CANADA, LTD., TORONTO

AIR CONDITIONING · · HEAT TRANSFER · · AIR HANDLING EQUIPMENT

Key

to a lower net cost for a better product

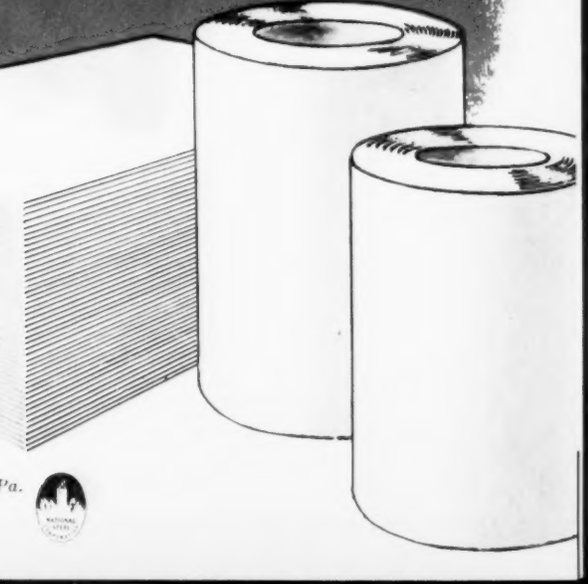
Use

Weirzin

ELECTROLYTIC ZINC COATED SHEETS
AND STRIP · PLAIN OR BONDERIZED

eliminates inventory loss *due to* RUST

and cuts pickling, cleaning, buffing



Weirzin offers you a real business advantage. It enables you to manufacture a definitely better product at an appreciably lower net cost.

ONE SAVING . . . The high corrosion resistance of Weirzin means a substantial saving in inventory *plus* reduced cleaning costs and the *elimination* of pickling and buffing operations.

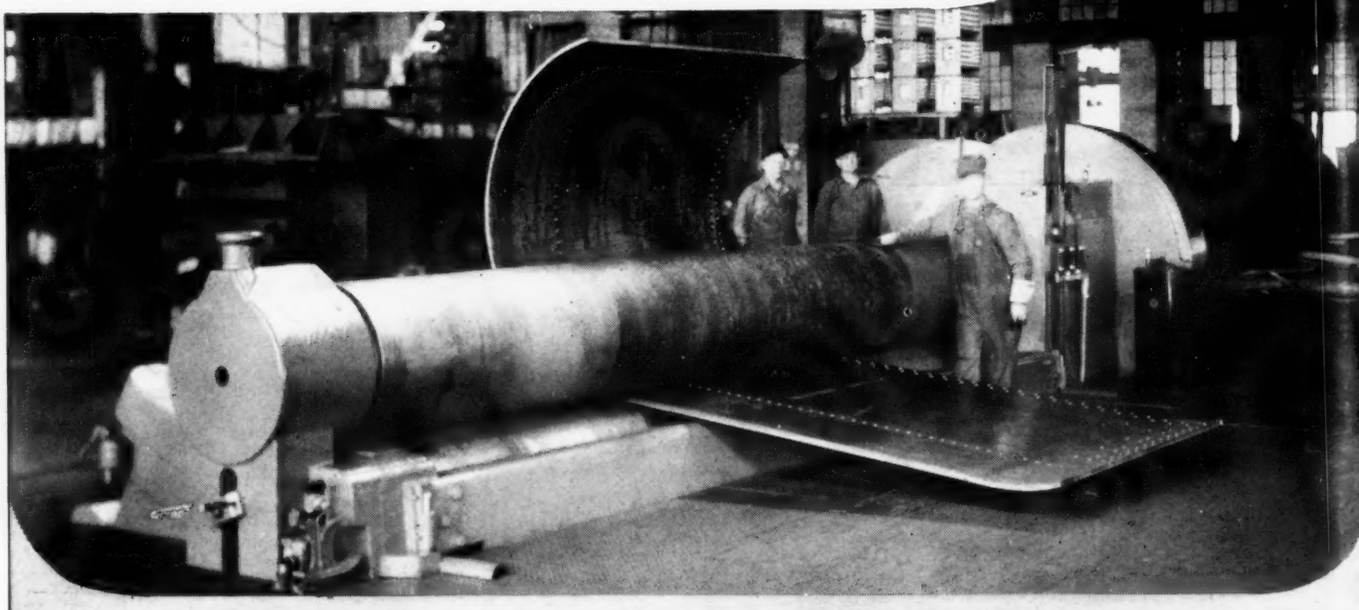
ANOTHER SAVING. Because of its extremely tight malleable coating and highly ductile base sheet Weirzin takes deep drawing and severe fabrication without damage to its protective surface—and retains its excellent base for subsequent finishes . . . *and* because it is available plain or Bonderized in coils up to 35" widths Weirzin lends itself to fast, automatic production equipment . . . Write for test sample.

WEIRTON STEEL CO.

WEIRTON, W. VA.

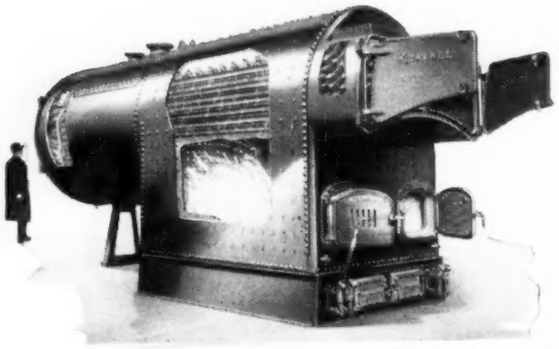
Division of **NATIONAL STEEL CORPORATION** *Executive Offices · Pittsburgh, Pa.*

INCH THICK STEEL PLATE ROLLED INTO CYLINDERS FOR...



KEWANEE Heavy Duty STEEL BOILERS

For Heating, Power and Process Steam



That rugged strength which adds extra years of life to Kewanee Boilers doesn't just happen . . . it is *first "engineered" then built into them* in the Kewanee Plant by America's top boilermakers.

Proper design and proportioning . . . resulting from 75 years of boiler building . . . make every Kewanee a fuel saver.

Hand or Mechanical Fired
100, 125, 150 LBS. W. P.
10 TO 304 H. P.

ARMY E NAVY

KEWANEE BOILER CORPORATION

KEWANEE, ILLINOIS

Branches in 60 Cities—Eastern District Office: 40 West 40th Street, New York City 18

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

75 YEARS BOILERMAKERS

YOUNG UNITS *Now Available*

Here's Good News! Young *All-copper Coil* Unit Heaters are available *without priority.*

The effort to satisfy the accumulated public appetite for the comfort and health advantages of modern heating, cooling and air-conditioning equipment has begun. Young Radiator Company is ready with a confidence built upon years of experience in the heat transfer field. The period of war achievement has added a generous contribution to the great store of technical and practical knowledge gathered by the Young engineering staff throughout years of painstaking research.

Modern heating will soon take its proper place in the great American standard of living. The future holds a promise of unlimited money-making and business-building opportunities for the enterprising contractor who is ready and able to meet the demands.

As fast as materials become available, Young Heater Units will meet any heating or air-conditioning requirement of the modern home, apartment building, store, school, factory, office, or public building. Are YOU ready to get your share of the business? Start NOW by writing today for further information about the advantages offered by Young.

YOUNG

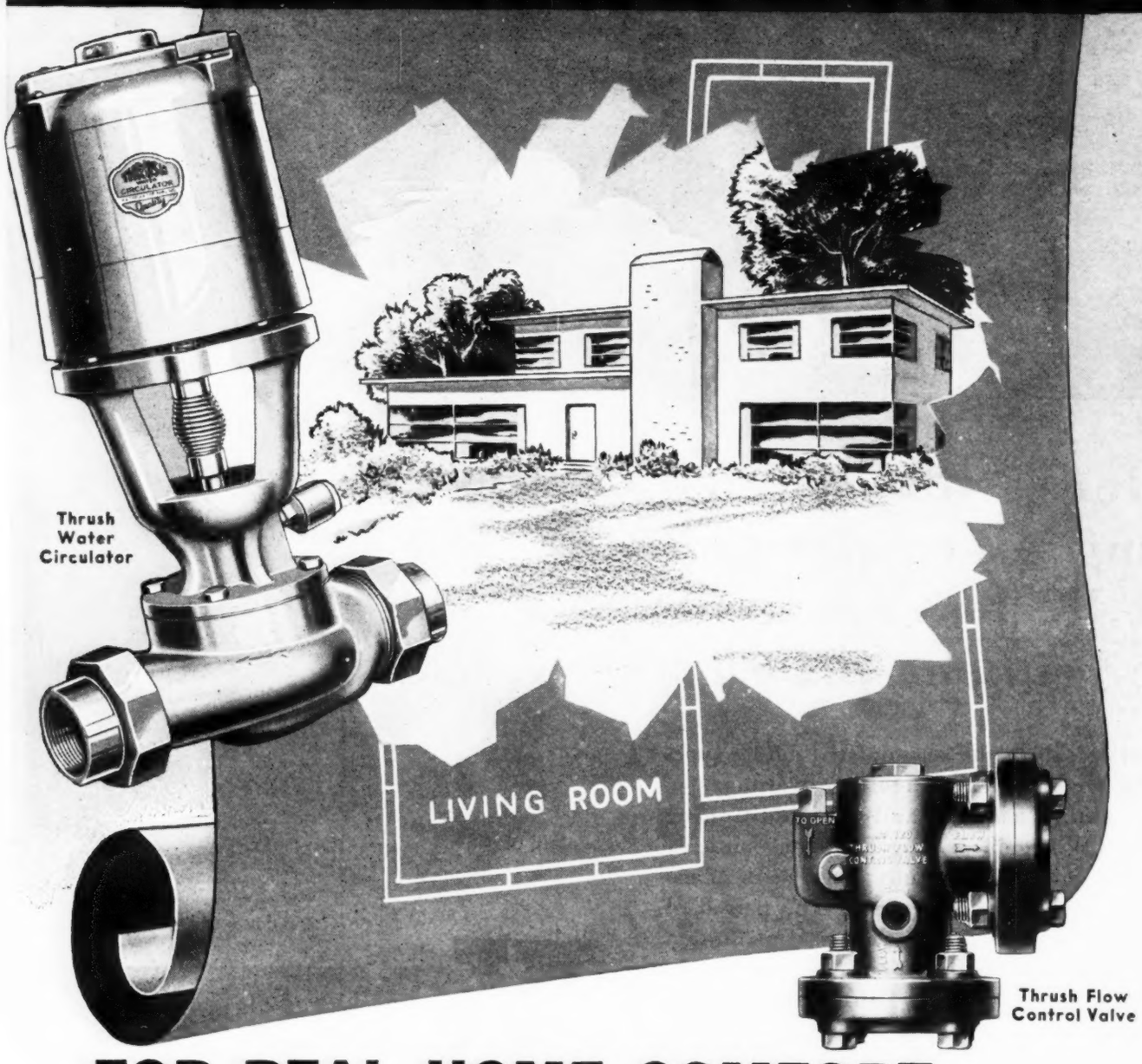
HEAT TRANSFER PRODUCTS

★ ★ ★

OIL COOLERS • GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS • HEAT EXCHANGERS • INTERCOOLERS • ENGINE JACKET WATER COOLERS • UNIT HEATERS • CONVECTORS • CONDENSERS • EVAPORATORS • AIR CONDITIONING UNITS • HEATING COILS • COOLING COILS • AND A COMPLETE LINE OF AIRCRAFT HEAT TRANSFER EQUIPMENT.

YOUNG RADIATOR CO., Dept. 105-H RACINE, WISCONSIN, U.S.A.

In Tomorrow's Blueprints
PUT THRUSH *FORCED* HOT WATER HEAT



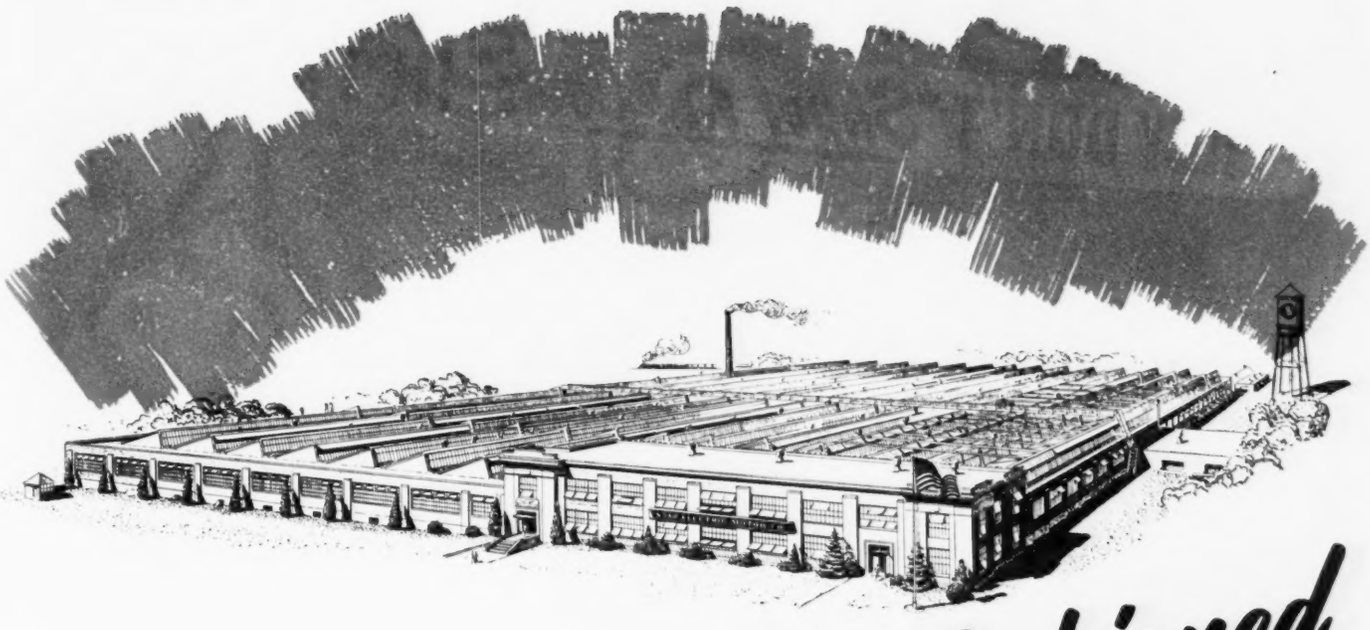
FOR REAL HOME COMFORT . . .

THRUSH
HOT WATER HEATER

ARE you telling the home owners of your community about forced circulating Thrush Summer-Winter Hot Water Heat? Now is the time to lay the foundation for a profitable post-war heating business. Thrush System provides uniform heating and real home comfort combined with fuel economy . . . and year 'round domestic hot water supply. You can recommend it not only for the homes of tomorrow but for modernization of old heating plants right now! If not familiar with Thrush equipment, see your wholesaler today or write Department D 8

H. A. THRUSH & COMPANY • PERU, INDIANA

Summer-Winter Hot Water Heat!



So, We'll BE Old-Fashioned

(IN OUR ADVERTISING)

Ad men tell us that plants haven t been shown in ads for 20 years. We're doing it anyway. Because the kind of plant we run has much to do with the kind of motors we make.

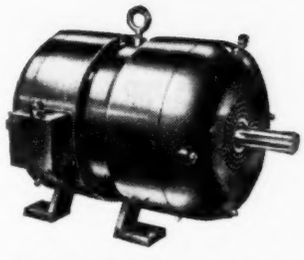
You see above what we call a BIG small plant, (290,000 sq. ft. and 1500 workers). Big enough to build a lot of motors of the kind Star builds. Small enough so we can keep a close eye on all the details that affect quality.

You see a plant that anybody would call modern. And, its equipment is as up-to-the-minute as the buildings, including fine research and testing facilities.

You Don't See the Important Part . . .

No picture can show you the kind of men who build Star Motors, or the way they work. But, come to visit us someday, and you'll see a plant full of real "motor men" . . . men who put the best of themselves, along with the best of materials into the motors they build. See us at our job and we won't need to sell you on making Star your *"Motor Department"*.

With a complete line of standard motors and design know-how that has licked "stumpers" in motor application for many important makers of power-driven products, Star is ready to work with you on any need. Early delivery of some standard motors can be made. For AC or DC motors ⅛ to 200 HP and AC or DC generators to 150 KW, write Star Electric Motor Company, 226 Bloomfield Avenue, Bloomfield, N. J.

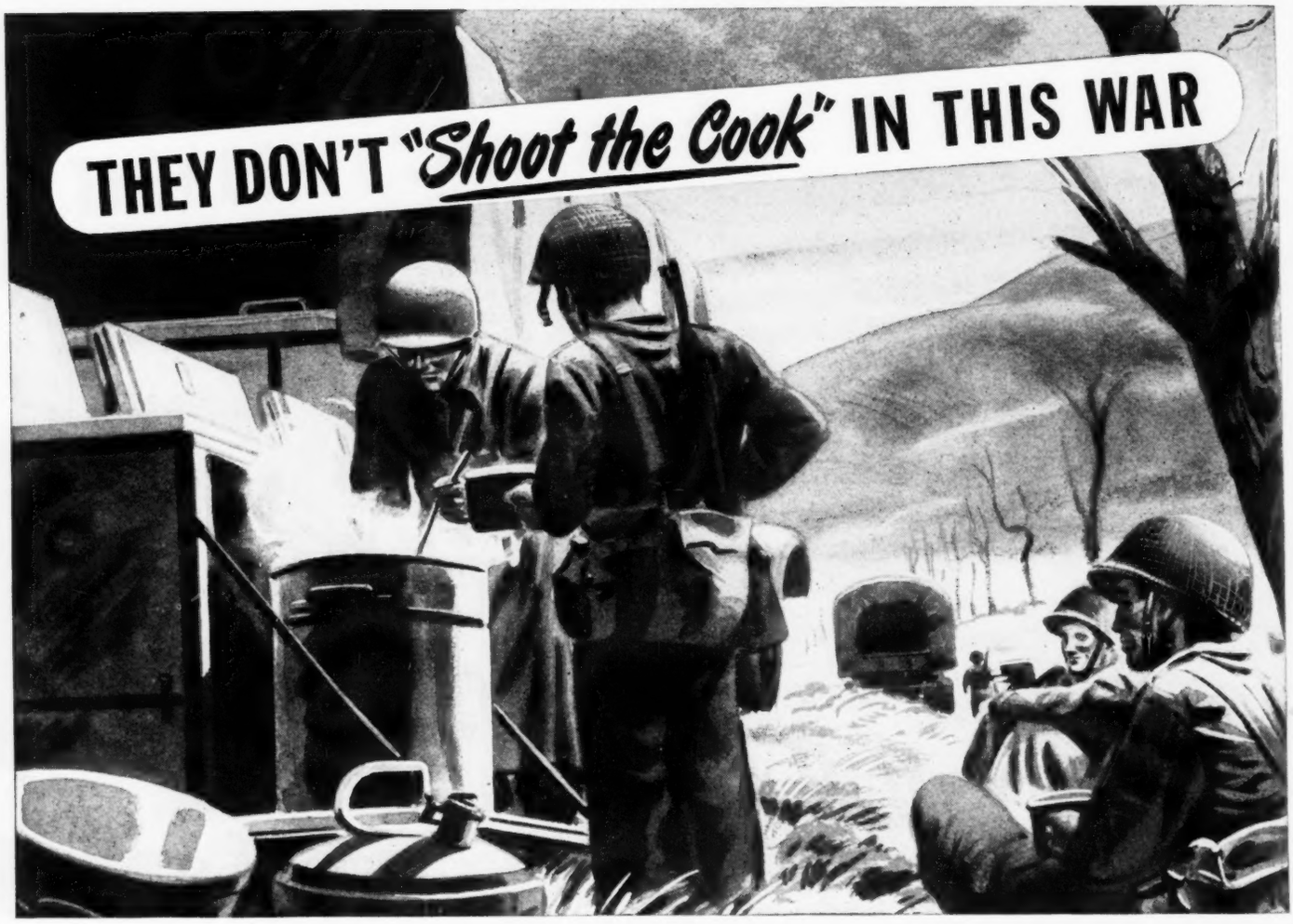


AC Fan Cooled Type in Star line of ⅛ to 200 HP motors.

ARMY NAVY (E)

STAR MOTORS

POWER PACKAGED AS YOU NEED IT



"DL" Float Valves Help Protect Rolling Field Kitchens

In the last war, someone was always shooting the cook—just about dinner time. The smoke from coal or wood-fired rolling kitchens made a fine target for enemy artillery and bombers.

Our army field kitchens are now fired by gasoline or oil. There is no telltale smoke to reveal the location of the kitchen and the mealtime concentrations of men. Meals can be cooked after nightfall because the kitchens do not glow.

Thousands of these field ranges, tent heaters, water heaters and furnaces—wherever our men are fighting—are equipped with "DL" Float Valves.

"DL" Float Valves are in demand by manufacturers of war equipment because of their simplicity of design. A screw driver is the only service tool needed.

When our soldiers return, thousands of them will remember the reliable service rendered by "DL" Float Valves, making much more saleable the postwar stoves, furnaces and heaters equipped with these valves.

An Important "DL" FLOAT VALVE FEATURE

AUTOMATIC TEMPERATURE COMPENSATION

Fuel oil viscosity increases as temperature drops. To avoid underfeeding when oil is cold—overfeeding when warm, the "DL" Float Valve has a simple temperature compensation which automatically maintains constant fuel delivery regardless of temperature.

DETROIT LUBRICATOR COMPANY

General Offices: DETROIT 8, MICHIGAN

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

Canadian Representatives: Railway and Engineering Specialties Limited, Montreal, Toronto, Winnipeg

"DL" Heating and Refrigeration Controls • Engine Safety Controls • Safety Float Valves and Oil Burner Accessories • "Detroit" Expansion Valves and Refrigeration Accessories • Stationary and Locomotive Lubricators

If you're dealing in tenths of a thousandth

PROTECT IT WITH MPM* FILTRATION

Take this Diesel injector nozzle as an example. The fine orifices in the spray tip are precision-drilled to exact tolerances to insure proper fuel injection. Yet unless these orifices are safeguarded against clogging or enlargement by harmful particles in the fuel, the benefits of precision manufacturing are lost.

To filter out these harmful particles, a Moraine Porous Metal filter element—bonded to a metal washer—is designed into the injector. It removes particles whose *largest dimension* is .001" to .002" . . . traps in its tortuous flow passages particles which would pass through the finest commercial screen.

Other types of applications for MPM filter elements include protection of *precision moving parts* against dirt in the lubricating or actuating fluid—*precision mechanisms* that are susceptible to dirt in the air—*any product* involving the flow of liquids, gases or air in which fine filtration or separation is required.

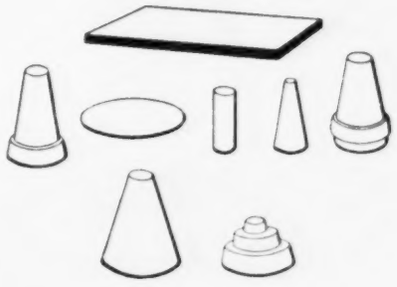
Where product performance depends on maintaining the accuracy of machined parts, Moraine Porous Metal has a lot to offer American industry.

KEEP YOUR BONDS—AND KEEP BUYING

*MORAINE POROUS METAL

A unique material of powder metallurgy, fabricated into efficient shapes and providing controlled porosity for these functions:

Filtration • Separation • Diffusion
Flow Control • Flame Arresters
Vents or Breathers



MORAINE PRODUCTS DIVISION OF GENERAL MOTORS

DAYTON, OHIO

You can't control the weather with "design conditions"

● Air conditioning specifications that call for a definite indoor humidity based on "design conditions" are fine and dandy, as long as the weather is that way, too.

However, when the sun gives way to storm clouds and Jupe Pluvius turns on the rain faucets, air conditioning systems equipped to meet only a design condition of 95°D.B.-78°W.B. cannot be expected to handle the 83°D.B.-78°W.B. day. Inside air grows chill and clammy. Complaints are heard . . . "the system isn't working!"

Perhaps that is why more and more engineers and contractors are incorporating the Bryant Silica-Gel Dehumidifier in their original air conditioning plans, for this unit helps maintain optimum conditions of temperature and humidity, regardless of variation in sensible and latent heat load.

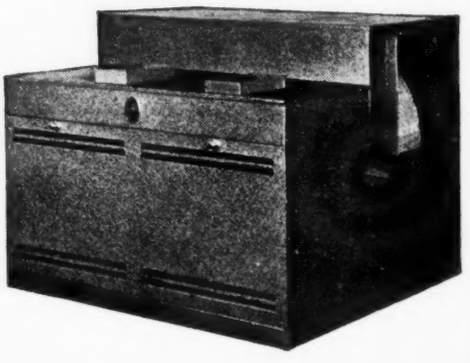
Make certain that your air conditioning job maintains perfect inside conditions over a *wide range* of outside design conditions. Ask the nearest Bryant distributor for complete details on Bryant Silica-Gel Dehumidifiers, or write direct to The Bryant Heater Company, 17825 St. Clair Avenue, Cleveland 10, Ohio . . . *One of the Dresser Industries.*

bryant

Silica-Gel DEHUMIDIFIERS

BOOK OF INSTALLATION DETAILS SENT FREE UPON YOUR REQUEST

Typical layouts showing how the Bryant Dehumidifier is used effectively in industrial, commercial and residential air conditioning systems are included in a helpful booklet titled "Planning Humidity Control." Write for your free copy, today.



1921-C — Delivers 15 CFM @ .4" S.P., 12,500 RPM. Overall length 4"; diameter 2-3/4"; weight 7 oz. (1/500 HP).

2881-A — Delivers 50 CFM @ .6" S.P., 9400 RPM. Overall length 4-1/8"; diameter 3-3/4"; weight 18 oz. (1/100 HP).

4581-A — Delivers 180 CFM @ 1." S.P., 7500 RPM. (1/12 HP). Overall length 6-7/16"; diameter 5-3/4"; weight 4 lbs. 2 oz.

5861-C — Delivers 400 CFM @ 1." S.P., 6300 RPM. (1/10 HP). Overall length 6-7/16"; diameter 7-1/16"; weight 5 lbs. 4 oz.

121 — Delivers from 1000 CFM @ .4" S.P. at 1750 RPM to 4300 CFM @ ⅞" S.P. at 7200 RPM for belt or direct drive, also available with built-in 3-phase motor. Overall length 10-1/2"; diameter 15".

DYNAMIC AIR AXIAL FLOW BLOWERS

. . . save weight, space and power input

*. . . deliver more air against high pressures**

Whether you want just a breath of air movement to cool a tiny hot spot, or a gale for ventilation — hot or cold — there's a Dynamic Air Axial Flow Blower that will do it quicker and better. Here's why —

1. ***They save 2/3 the space*** **required by bulky, old fashioned, centrifugal blowers.**
2. ***They weigh less than 1/2*** **as much as the old fashioned types.**
3. ***Much less power input*** **is required for a specified amount of air delivery.**

All of these advantages are the *direct* result of the *direct* air flow that is possible only with axial flow.

Based on 14 years of development, Dynamic Air Axial Flow Blowers represent the most advanced application of this principle. They bring you great possibilities for air engineering against static pressures as high as 10" or more W.G.

All are designed to rigid performance and weight specifications. Adaptations can be made to the most precise requirements. *Consult us about your blower problem.*

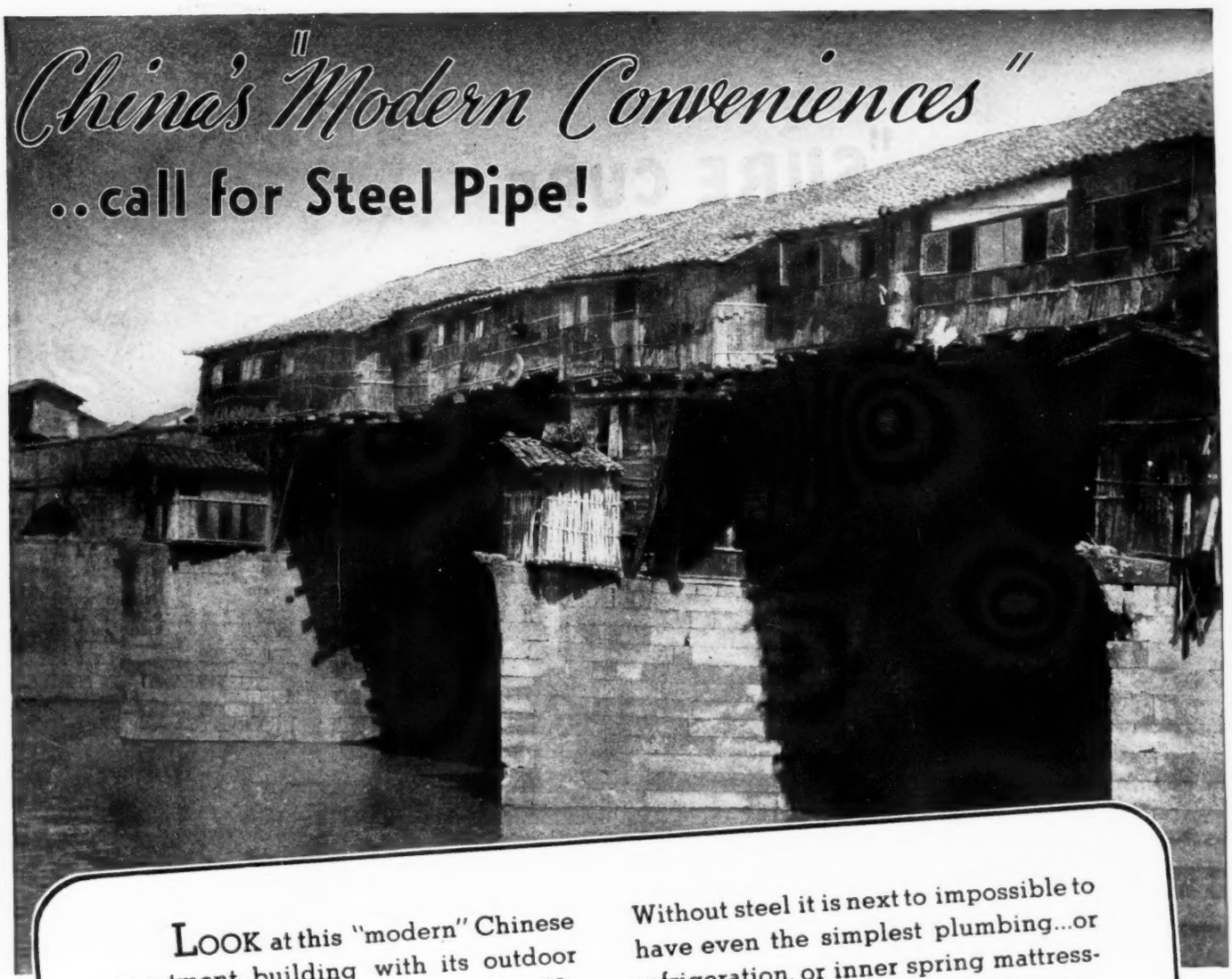
In addition to the typical models shown, many others are available in single and two stage ratings up to 100,000 CFM @ 10" S.P., with motors in standard voltages and cycles. You'll find the one you need in the Dynamic line.

DYNAMIC AIR ENGINEERING Inc.

LOS ANGELES, U. S. A.

DESIGNERS and BUILDERS of HIGH EFFICIENCY AXIAL FLOW EQUIPMENT

China's "Modern Conveniences" ..call for Steel Pipe!



LOOK at this "modern" Chinese apartment building with its outdoor facilities overhanging the river. No doubt every bridge houses similar accommodations. And this same river may provide the water supply for all human needs--garbage disposal, laundry, bathing, drinking.

Oriental housing is so different that we call it "quaint" and "picturesque". We could truthfully describe it as "inconvenient", "uncomfortable", "unsanitary"

Why do the people of the East endure this? Do they prefer to drink unclean water, to wash and bathe in primitive ways?

No, of course, not. You know the answer. Their backwardness is due in large part to lack of steel. Without steel it is next to impossible to have even the simplest plumbing...or refrigeration, or inner spring mattresses, or scores of other household accessories that help make living in America a joy instead of a burden.

America's well-being depends on steel. When war's demand is ended, there will be steel enough for present American homes to be modernized and new ones built...with modern conveniences never even known before.

One way in which we Americans can contribute to lasting peace is to help other peoples of the world to appreciate and enjoy the high standards of living that steel makes possible.

QUALITY YOUNGSTOWN SERVICE

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO

Manufacturers of

CARBON · ALLOY AND YOLOY STEELS

Pipe and Tubular Products · Sheets · Plates · Conduit · Bars · Coke Tin Plate · Electrolytic Tin Plate · Rods · Wire · Nails · Tie Plates and Spikes.

JANITROL Gas-Fired Unit Heaters give top-notch performance . . . and *keep it up* for years and years of satisfying service. Why? Because Janitrol is *designed* for long-lasting operation.

For example, Janitrol cast iron Multi-Thermex heating tubes are *designed* to take *exactly the right amount* of heat from the burned gases passing through them. Too *little* heat extraction means waste of fuel. Too much can cause condensation and corrosion on heat transfer surfaces.

Burnouts are eliminated by the unique manner in which the Multi-Thermex tubes fit snugly over the compact Amplifire burners . . . no bulky combustion chamber to build up excessive heat at the base of the tubes.

When dust accumulates in the bottom of the tubes, the insulating action *does no harm* in Janitrol because the bottom of the tubes are actually the coolest part of the heat exchanger surface.

And these are only a few of the many design developments which make Janitrol *your best buy* in industrial and domestic heating equipment. Remember, Janitrol is built to *last.* No other unit heater has all of Janitrol's engineered advantages! For more information write, without obligation, to Surface Combustion, Toledo 1, Ohio.

Janitrol

GAS-FIRED HEATING EQUIPMENT

If it's to be painted insist on this *TRIPLE PROTECTION*

See Sweet's Catalog for uses, advantages and general specifications of these Armco special-purpose sheets:

Galvanized ARMCO Ingot Iron.

ARMCO Galvanized PAINTGRIP Steel (also available with ARMCO Ingot Iron or Copper-Steel base)

ARMCO Stainless Steels

The "Scratch Test" shows how paint sticks to ARMCO Galvanized PAINTGRIP. The top half of the sample is Bonderized at the mill. When scratched with a penknife only a slight mark can be seen. Paint on ordinary galvanized steel (bottom half) scrapes off readily.

This "peel-off" picture clearly shows the advantages of ARMCO Galvanized PAINTGRIP Steel for *all sheet metal work to be painted.*

No. 1 is the smooth, tight paint finish that can be applied as soon as the work is done, and which lasts several times longer than paint on ordinary galvanized or uncoated sheets.

No. 2 is the special mill-Bonderizing that takes and preserves the paint without pre-treatment. No fuss, no bother, no added cost.

No. 3 is the full-weight galvanized coating that protects the high-quality iron or steel base from rusting.

Remember, it actually costs less to use ARMCO Galvanized PAINTGRIP than ordinary galvanized and acid-etch it before painting. You get a smooth job in less time and it stays attractive longer. Exposed air ducts, furnace casings and other painted work—these are just a few of the heating and air conditioning uses.

Write for the ARMCO PAINTGRIP booklet, which gives complete information on fabricating, finishing and applications of this special sheet steel. The American Rolling Mill Co., 1721 Curtis St., Middletown, Ohio.

THE AMERICAN ROLLING MILL COMPANY

Special-Purpose Sheet Steels

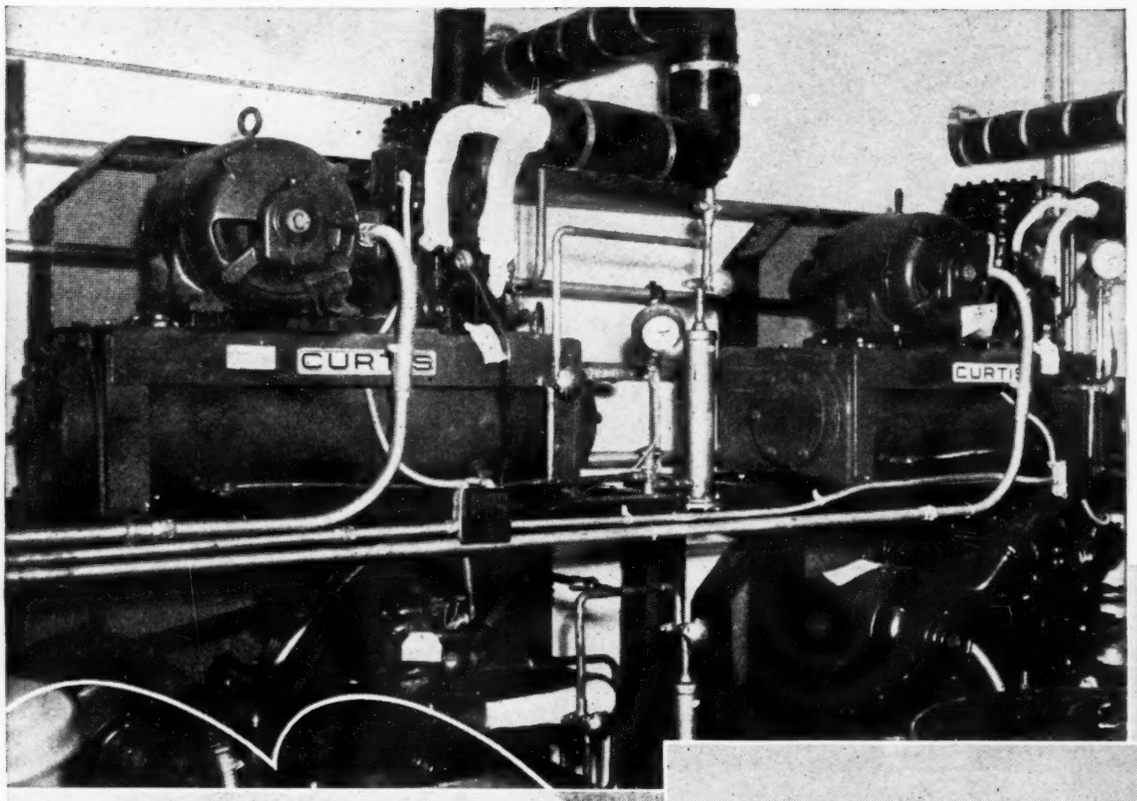
HONEYWELL *Personalized* HEATING CONTROLS *Chosen for* NEW BERWYN APARTMENT

Tenants of the new Bonie-Marie Apartments, now being completed at Berwyn, Illinois, will enjoy the comfort and advantages of Honeywell Personalized Heating Control. An F. H. A. project, this building has 21 three and four room apartments. Each apartment has its own pneumatic thermostat controlling radiator valves so that tenants can regulate temperature to suit their individual needs. Different temperatures can be obtained in each separate apartment, and overheating with waste of fuel will be eliminated. Honeywell Personalized Heating Control is available for every apartment building, old or new, large or small. Its cost is surprisingly low. If you are not familiar with Honeywell Personalized Heating Control write for complete information or call our branch in or near your city.

Owner of the Bonie-Marie Apartments is Walter S. Baltis, of Baltis Built Homes. Architect is Carl J. Kastrup and the heating contractor is Edw. F. Tupa.

Minneapolis-Honeywell Regulator Co., 2715 Fourth Avenue South, Minneapolis 8, Minnesota.

MINNEAPOLIS **Honeywell**
CONTROL SYSTEMS

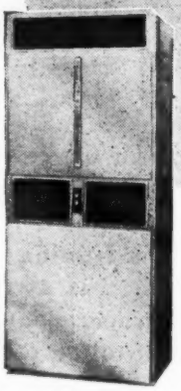


At Left: A part of the Curtis Compressor equipment serving the refrigerating requirements of the plant.

Below: Exterior of locker plant — 830 lockers.

CURTIS REFRIGERATION *-Is the Heart* of This Efficient LOCKER PLANT

Refrigeration dealers can not only profit by constructing new locker plants, but there is profit to be gained in rebuilding and modernizing plants that are not adequately refrigerated or insulated. In many locker plants throughout the country, CURTIS Refrigerating Units are proving the answer to the demand for dependable, efficient, trouble-free performance throughout an exceptionally long machine life.



3 and 5-ton Packaged-Type Air Conditioner.

Ask about Curtis Air-Conditioning Equipment, too.

WRITE FOR COMPLETE STORY ON THIS UP-TO-DATE CURTIS-EQUIPPED LOCKER PLANT

Bulletin RX-3 will be mailed on request

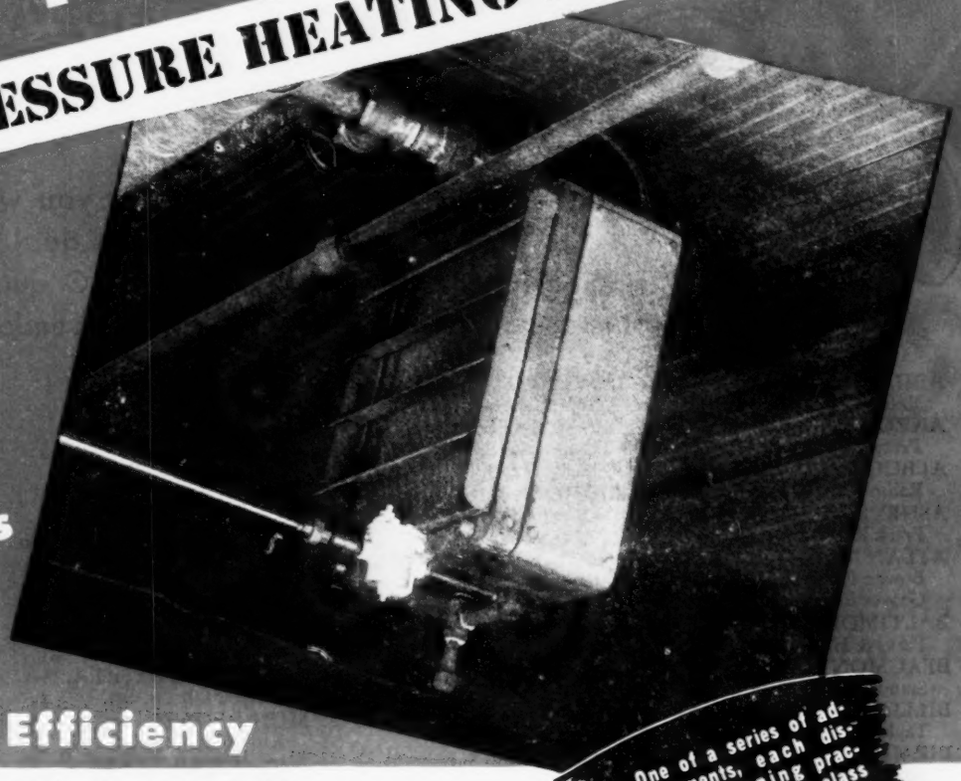
CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1999 Kienlen Avenue • St. Louis 20, Missouri

CURTIS REFRIGERATION AIR CONDITIONING ... COMMERCIAL

B-456

FOR VICTORY BUY MORE WAR BONDS AND STAMPS

HOW TO TRAP A LOW PRESSURE HEATING SYSTEM



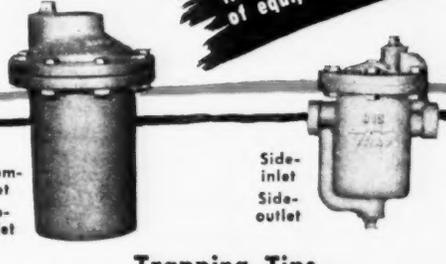
. . . for Lower Costs • and Greater Efficiency

One of a series of advertisements, each discussing trapping practice on a different class of equipment.

Reduces Trap Maintenance 50%; Heats Up Buildings 50% Faster; Reduces Coal Consumption 5 Tons Per Day.

Many trap users have found by experience that maintenance costs for so-called low pressure traps on easy heating service were GREATER than for Armstrong Traps on heavy duty high pressure service. Furthermore, records have shown that the extra maintenance costs more than made up for any saving in first cost. It is not surprising, therefore, that these buyers have standardized on Armstrong Traps for all services, with these typical results: Defender Photo Supply Co., Rochester, N.Y., put 300 Armstrong Traps on unit heaters, fin coils, etc., and found trap maintenance reduced about 50% . . . New York Military Academy heats up buildings 50% faster in the morning with Armstrongs . . . Springfield, Ohio, high school reduced coal consumption from 9 tons to 4 tons daily . . . Atlanta building reports: "Not one cent for trap maintenance in 10 years."

It pays to buy quality. Armstrong traps don't leak steam; they have adequate automatic air handling capacity; they'll last a long time because of chrome steel valve and seat (ground, hardened and lapped) and stainless steel bucket and valve lever assembly. Nothing to stick, clog or collapse. For any pressure, any vacuum. Write for a survey of your plant today. ARMSTRONG MACHINE WORKS, 846 Maple St., Three Rivers, Michigan.



Trapping Tips for Heating Systems*

- Use one trap for each unit.
- Install trap close to and below unit being drained.
- Use traps with adequate air venting capacity. (Armstrong traps available to remove 500 to 1500 cu. ft. free air per hour.)
- Use traps that discharge condensate at steam temperature with no wait for cooling.
- Use high quality traps — any extra first cost will be repaid over and over in reduced maintenance.

*Ask for Armstrong CATALOG H — 36 pages of tables, data, diagrams on trap selection, installation and maintenance.

ARMSTRONG *Inverted Bucket* STEAM TRAPS

Over a Million in Use . . . For Power . . . Process . . . Heating

CALL YOUR ALCO JOBBER

– for better Valves, Tools, Supplies and *Service*

There's a refrigeration jobber near you who stocks ALCO Valves. That means a good firm to deal with – carefully selected for service on a par with ALCO quality. For greater satisfaction in every way, rely on your dependable ALCO jobber.

ABILENE, TEX.
Refrigeration Sup. & Elec. Co.
AKRON, OHIO
Percy G. Hanson
ALBUQUERQUE, N. M.
Radio Parts Co.
ASHEVILLE, N. C.
Freck Radio & Supply
ATLANTA, GA.
Bowen Refrig. Supplies, Inc.
Graves Refrigeration
BALTIMORE, MD.
Parks & Hull Appliance Corp.
BEAUMONT, TEX.
Standard Brass & Mfg. Co.
BILLINGS, MONT.
Taylor Refrig. & Appl. Co.
BIRMINGHAM, ALA.
Refrig. Sup. Distributor
BOSTON, MASS.
A. E. Borden Co.
Melchior, Armstrong, Dessau
BROOKLYN, N. Y.
Melchior, Armstrong, Dessau
BUFFALO, N. Y.
Foster Supply Co.
CEDAR RAPIDS, IOWA
Thermal Co., Inc.
CHARLESTON, S. C.
Allen & Webb
Corvette's Supply Co.
CHARLOTTE, N. C.
Bowen Refrig. Supplies, Inc.
CHICAGO, ILL.
Chase Refrigeration Sup. Co.
Fred C. Kramer Co.
Refrigeration Supply Jobbers
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Williams & Co., Inc.
CLEVELAND, OHIO
Refrigeration Supplies Co.
Williams & Co., Inc.
COLUMBUS, OHIO
Mason Supply Co.
Williams & Co., Inc.
DALLAS, TEX.
The Electromotive Corp.
Snell Refrigeration Sup. Co.
DAVENPORT, IOWA
Republic Electric Co.
DES MOINES, IOWA
Dennis Refrigeration Sup. Co.
Thermal Co., Inc.
DETROIT, MICH.
Riopelle Supply Co.
EVANSVILLE, IND.
Budlock Refrig. Sup. Co.
FLINT, MICH.
Shand Radio Specialties
FRESNO, CALIF.
Arbell Refrigeration Sup. Co.
GARY, IND.
Engineering Specialty Co., Inc.
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Refrigeration Supply Co.
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Joseph Simons Co.
HONOLULU, T. H.
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HOUSTON, TEX.
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Walter Refrig. Supply Co.
INDIANAPOLIS, IND.
Central Supply Co.
F. H. Langsenkamp Co.
JACKSONVILLE, FLA.
Bowen Refrig. Supplies, Inc.
Refrigeration Supply Corp.
KANSAS CITY, MO.
Forslund Pump & Mach. Co.
Superior Refrig. Supply Co.
LEXINGTON, KY.
United Service Co.
LINCOLN, NEB.
Wickham Supply Co.
LITTLE ROCK, ARK.
Refrigeration Supply Co.
LONG BEACH, CALIF.
L. B. Marsh Allied Refrig. Co.
LOS ANGELES, CALIF.
Authorized Supply Co.
Pacific Metals Co., Ltd.
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F. H. Langsenkamp Co.
MADISON, WIS.
Automatic Temp. Sup., Inc.
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L & N Wholesalers
SHREVEPORT, LA.
Standard Brass & Mfg. Co.
SIOUX CITY, IOWA
Dennis Refrigeration Sup. Co.
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Central Service Supply Co.
TAMPA, FLA.
Bowen Refrig. Supplies, Inc.
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Vaeth Electric Company
VANCOUVER, B. C.
Fleck Brothers, Ltd.
WICHITA FALLS, TEX.
United Electric Service Co.
WILKES-BARRE, PA.
Gen. Radio & Electronic Co.
WILMINGTON, N. C.
S. R. S. Distributors
YOUNGSTOWN, OHIO
Refrigeration Supplies Co.

ALCO

ALCO VALVE CO.

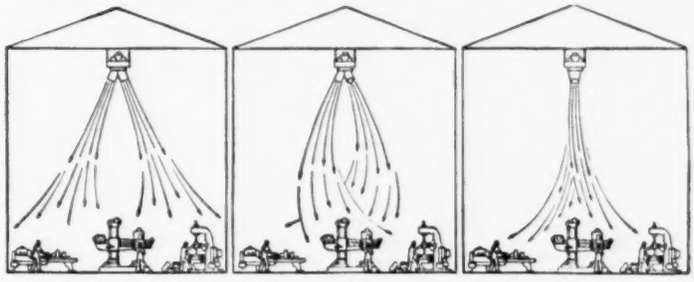
859 KINGSLAND AVE. • ST. LOUIS 5, MO.

Cooling with HEATERS!

WING
REVOLVING
UNIT HEATERS
(WITH STEAM TURNED OFF)

Keep Workers Cool, Comfortable and Invigorated . . .

THE same virtues that make Wing Revolving Unit Heaters the ideal means of heating a plant or building are responsible for their unparalleled success in summer cooling. With heating sections turned off and only the fans operating, the discharge outlets revolve slowly, just as they do for the distribution of heated air, projecting a cooling stream of air to the working level, sweeping slowly around and under machinery and other obstacles, relieving the oppressive, stagnant atmosphere, bringing renewed vigor to the workers.



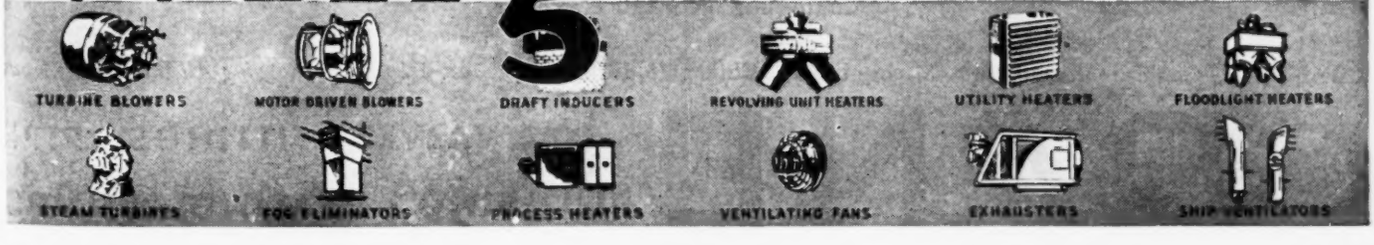
AIR STREAM REVOLVES SLOWLY, CREATING A GENTLE, COOLING BREEZE

WHY THE REVOLVING DISCHARGE IS SUPERIOR • FOR BOTH HEATING AND COOLING •

The exclusive Wing revolving discharge secures its uniform, even distribution because it moves slowly through the full 360° of a circle, thereby spreading the streams of air to all sides and corners of room or building, circulating over, under and around obstructions and creating a gentle, pleasant movement of the air around the workers. In winter, this movement of the heated air warms pleasantly, while avoiding hot blasts. In summer, it cools by keeping the air in motion, the best-known method of cooling.

L. J. Wing Mfg. Co. 158 W. 14th St., New York 11, N. Y.

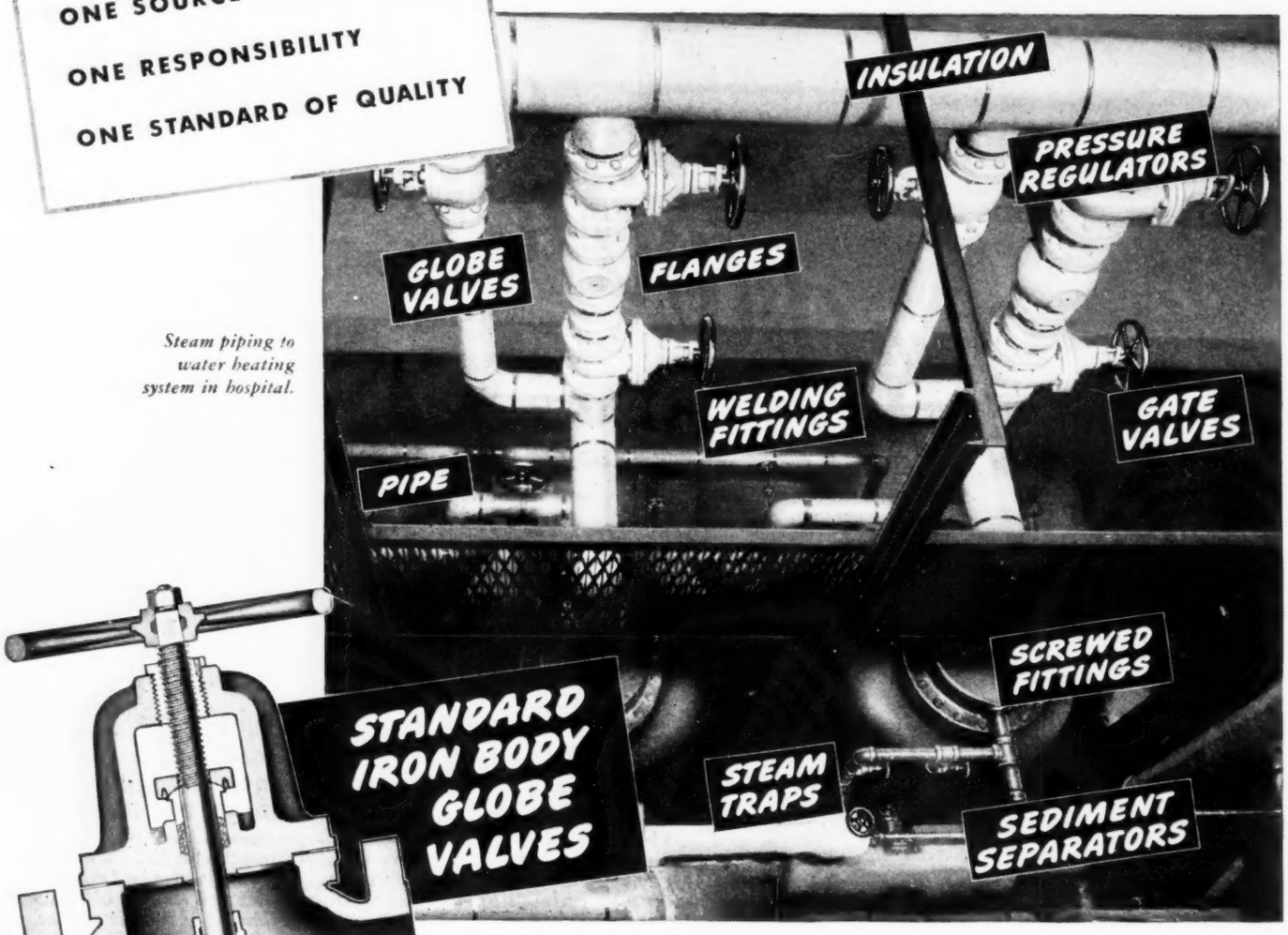
Wing REVOLVING UNIT HEATERS



You Can Specify CRANE for All Piping Materials

Valves, fittings, pipe, fabricated assemblies, piping accessories—you get them all from your Crane Branch or Wholesaler. By using Crane *complete* piping materials service, you have the advantage of the world's greatest selection—in brass, iron and steel. There's no better way to assure a good installation than with all materials of Crane high quality—backed by single responsibility. You'll find it's the smart way to simplify and speed deferred replacement work—and keep piping at its best. A typical Crane solution for many of your valve application problems is shown below.

ONE SOURCE OF SUPPLY
ONE RESPONSIBILITY
ONE STANDARD OF QUALITY



Steam piping to water heating system in hospital.

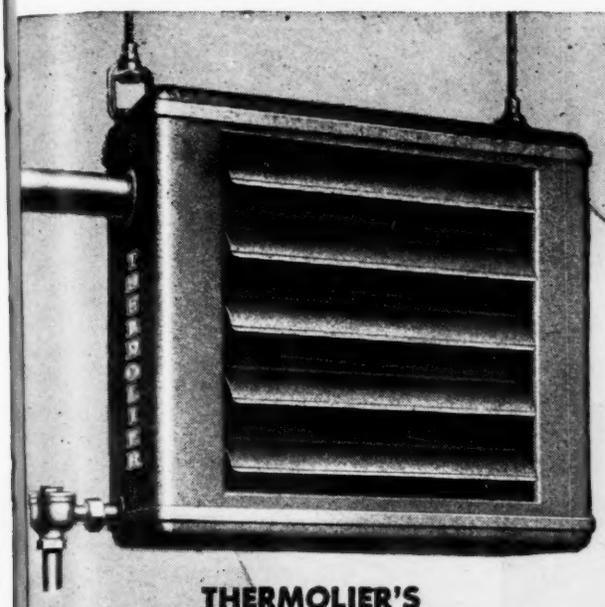
SERVICE RECOMMENDATIONS: ***Crane Standard Iron Body Globe and Angle Valves*** meet all general service requirements with working pressures up to 125 pounds steam. Brass-trimmed valves are recommended for steam, water, and fluids non-corrosive to brass or iron; all-iron valves for fluids that corrode brass but not iron. Also available with choice of composition discs for steam, hot water, cold water, air, oil, and other services. In all sizes from 2 in. up—with screwed or flanged ends. See your Crane Catalog for specifications.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas*

CRANE

90 YEARS OF PROGRESS

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS



THERMOLIERS *are back again!*

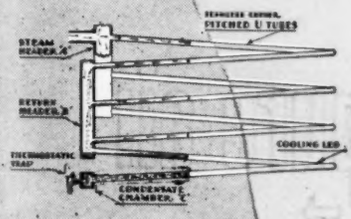
Now is the time to do something about your unsatisfactory heating equipment, before last winter's headaches are repeated.

Here's good news for you. GRINNELL is making THERMOLIERS again. They are the same efficient, engineered unit heaters that have been delivering more heat at less cost for thousands of satisfied customers for years.

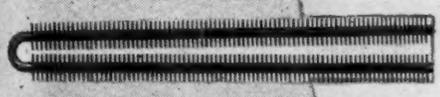
Talk over your heating problems with a Grinnell Engineer. He'll show you how Thermoliers distribute heat uniformly to every square foot of your buildings, improve employee morale and output and save up to 27% of still-scarce fuel.

Thermoliers' 12 points of superiority make them the logical choice in unit heaters. Ask for the new Grinnell Thermolier catalog 6-E. It gives all the details of construction, application, capacities and installation. Grinnell Company, Inc., Executive Offices, Providence 1, R. I. Branch offices in principal cities.

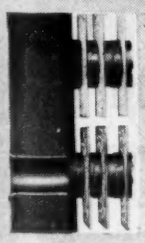
THERMOLIER'S SUPERIOR FEATURES



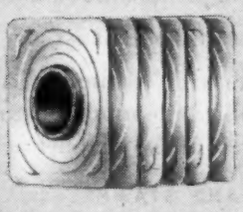
INTERNAL COOLING LEG assures continuous drainage of condensate and makes a simple thermostatic trap practical. It is equal to a run of more than 100 feet of ordinary exterior cooling leg piping.



BUILT-IN EXPANSION PROVISIONS. The "U" type tubes allow expansion and contraction, ease damaging strains.



LEAKPROOF TUBE-TO-HEADER CONSTRUCTION. Joints made by the expanding method assure safety and durability.



SUPERIOR HEATING ELEMENT. Square copper fins on strong seamless copper tubing provide 24% more radiating surface.

Other Points of Thermolier Superiority

Tube design minimizes dirt collection • built-in drainage • continuous rated capacity • heavy frame gives greater rigidity • motor and fan meet specific Thermolier requirements • simple piping connections • adjustable hangers facilitate erection • packed for easy installation.

GRINNELL

Thermolier Unit Heaters

FOR FULL VALUE FROM FUEL DOLLARS

"Columbia" Activated Carbon REMOVES Odors from Air

1 It deodorizes stale air for return to air conditioning systems.

2 It purifies intake air to remove objectionable outside odors.

3 It removes objectionable odors from exhaust air.

Installations for deodorizing air with "Columbia" Activated Carbon are supplied by a number of reputable engineering firms. Write for name and address of the supplier near you.

•

CARBIDE AND CARBON CHEMICALS CORPORATION
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.

BUY UNITED STATES WAR BONDS AND STAMPS

COLUMBIA
TRADE-MARK
Activated Carbon

Life-Saver for Men and Materials

SOLVENT RECOVERY · CATALYSIS · GAS AND AIR PURIFICATION

... but this one is not retouched

★ *A few months ago we pictured in this publication a heavy-wall tee with a remarkably long outlet—so long in fact that a few of our friends were a little skeptical and implied that we had perhaps over-extended our poetic license, as well as the outlet, in retouching the photo.*

Well . . . this one, as you can plainly see, is not retouched. The tee was photographed before machining just to show what can be done with hot metal if you know how.

YES, "*if you know how.*" . . . And it will pay you to keep this matter of "know-how" in mind when you choose standard welding fittings. The need for unusual knowledge and highly specialized skills may be less apparent in regular fittings than in specials like this, but make no mistake: it is *no less essential.*

That is why we have cited this and many other unusual jobs which testify so eloquently to the "know-how" of Taylor Forge. This knowledge has enabled us to put into WeldELLS and other Taylor Forge welding fittings every feature wanted by everyone from the pipe designer to the welder.

In fact, you will see the evidences of this in every WeldELL . . . in the strength features like the selective distribution of extra metal where strains are greatest . . . in the convenience features like the tangents, the quarter-marked ends, the machine-tool bevels, the extremely accurate dimensions. Indeed, you will see that

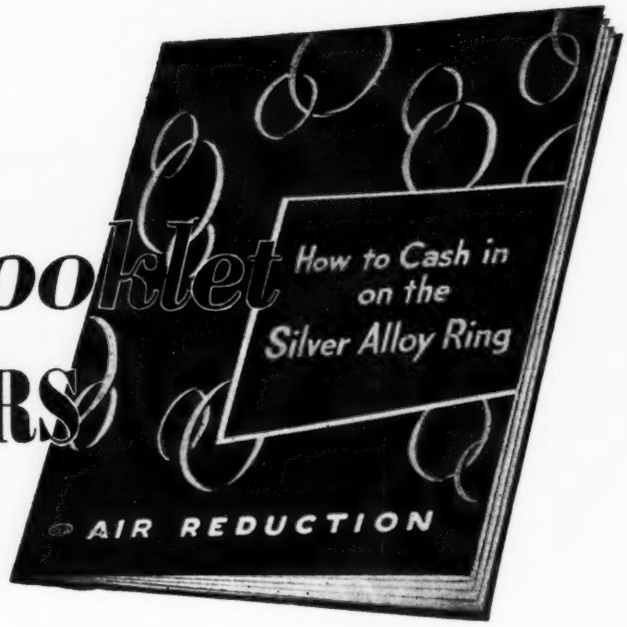
WeldELLS have everything

WeldELLS alone combine these features:

- **Seamless** — greater strength and uniformity.
- **Tangents**—keep weld away from zone of highest stress—simplify lining up.
- **Precision quarter-marked ends** —simplify layout and help insure accuracy.
- **Selective reinforcement** — provides uniform strength.
- **Permanent and complete identification marking**—saves time and eliminates errors in shop and field.
- **Wall thickness never less than specification minimum**—assures full strength and long life.
- **Machine tool beveled ends**—provides best welding surface and accurate bevel and land.
- **The most complete line of Welding Fittings and Forged Steel Flanges in the World** — insures complete service and undivided responsibility.

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P.O. Box 485
New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

This FREE *booklet* IS WORTH DOLLARS TO YOU



With billions of dollars to be spent during the next few years for new building, remodeling and repairs, there will be MORE business and MORE profits for contractors who are able to install the Silbraz* joint – the threadless, modern method of joining copper and brass into a "one-piece", leakproof pipe line.

In thousands of installations – from cottages to battleships – the Silbraz joint has proved its ability to take it under all conditions for as long, or longer than the pipe itself.

Architects and owners know these performance records – they want that kind of performance in the public buildings, hospitals, schools, plants, office and mercantile buildings, apartments and better-class homes they'll design and build. They'll demand Silbraz joints for both plumbing and heating systems.

This new booklet tells you all about the Silbraz joint – how to install it, tools required – everything you need to know.

MAIL the coupon for your FREE copy today!

Air Reduction
60 East 42nd St.
New York 17, N. Y.

Send a copy of the free booklet describing the Silbraz joint—how it's installed, the tools to use, etc.—to:

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

*REG. U.S. PAT. OFF.

AIRCO

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General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.
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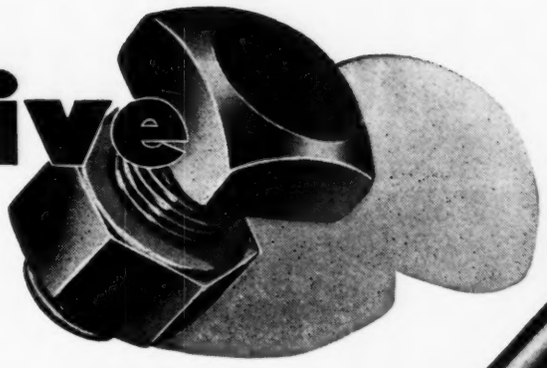
"mr. five by five"



or "six — six"

Ⓑ

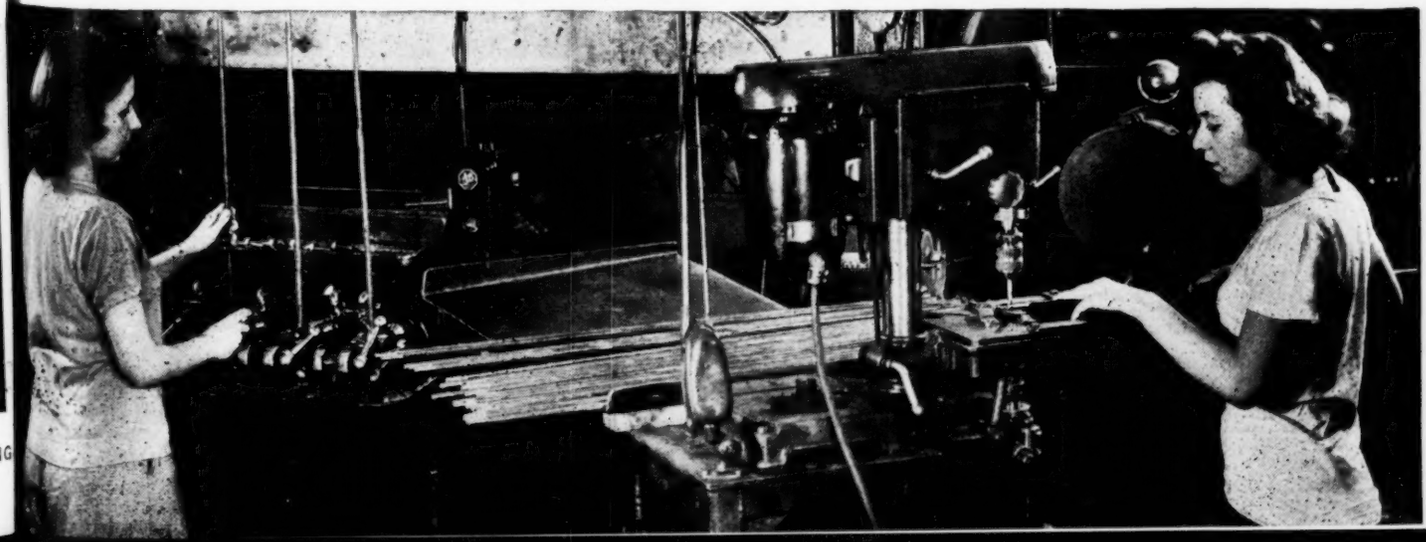
Because of the versatility of our modern equipment, Buffalo Bolt is in a position to supply you with any size or shape circle Ⓑ fastener—standard or special—for your present war effort or post-war planning.

BUFFALO BOLT COMPANY

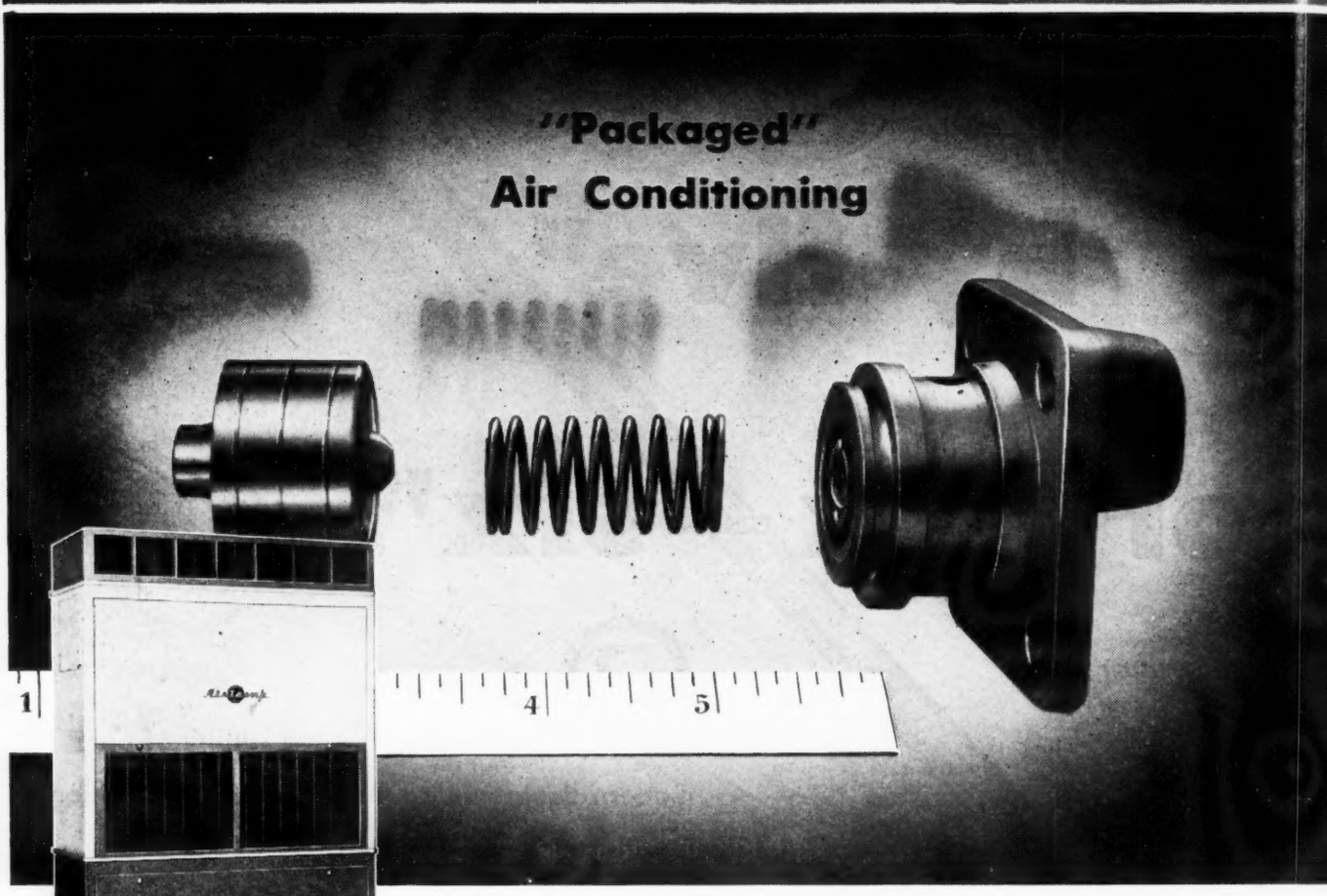
NORTH TONAWANDA, NEW YORK

SALES OFFICES IN PRINCIPAL CITIES

Drilling the rods for cartridge cases. Millions have been turned out by Buffalo Bolt Company since Pearl Harbor.



CHRYSLER AIRTEMP



Simple Unloader Mechanism Means Economical Operation

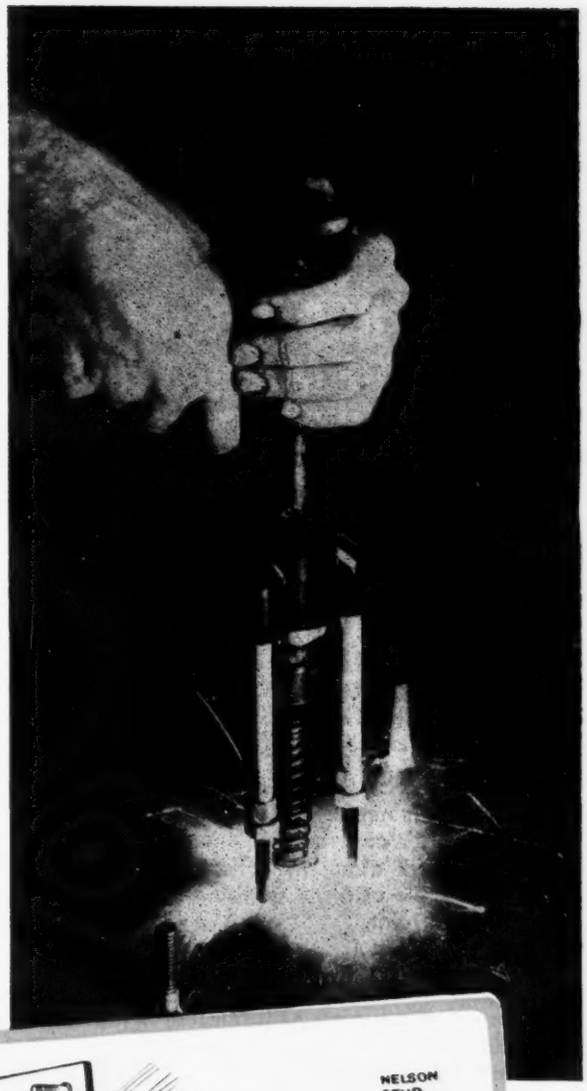
The Chrysler Airtemp hermetically sealed compressor gets a good running start before picking up the load. When not in operation suction and discharge pressures are equalized. A spring allows by-pass to remain open until the compressor comes up to speed (⅓ to ½ a second)—then oil pressure closes the by-pass. This permits the use of a normal torque, low inrush motor requiring a minimum starting current. Unloaded starting is another one of the many built-in features which results in efficient operation and low up-keep.

The Chrysler Airtemp hermetically sealed compresso seals out air, dirt and moisture permanently. It i designed for long, trouble-free service. The compresso of the "Packaged" Air Conditioner, pioneered b Chrysler Airtemp, is pressure lubricated and all vita moving parts are Superfinished. For time-tested an proven temperature-humidity control equipment tur to Chrysler Airtemp. You will find there is a capacit range ideal for practically every need. • Airtem Division of Chrysler Corporation, Dayton 1, Ohi

Invest in Your Future—Buy War Bonds! You'll enjoy "The Music of Morton Gould," Thursdays, CBS., 9 p.m., E.W.T.

HEATING • COOLING • REFRIGERATION

How Nelson *Automatic* Stud Welding saves time and material—



Here is a complete fusion weld that is obtained in less than ½ second! Yet the resulting stud weld is stronger than the strength of the stud. By this welding method precision work is obtained economically and close tolerances are held.

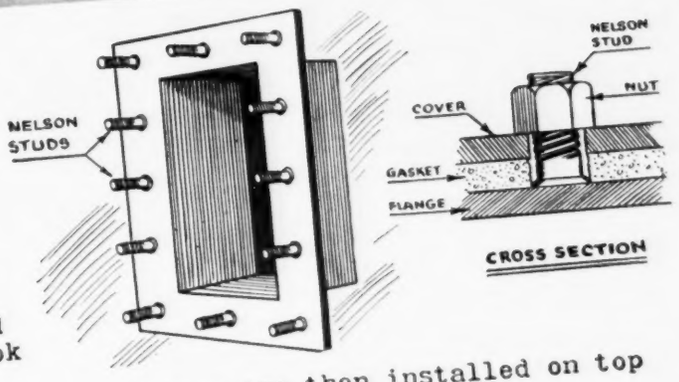
Below is a typical example of how Nelson Stud Welding is helping one manufacturer save time and material. Consistent results like this, *automatically* produced, can be obtained wherever studs can be end-welded to metal surfaces.

The equipment for Nelson Stud Welding is handy to use and completely portable — or may be obtained as a single or multi-gun precision jig for close tolerance production of stud welded parts. It is easily operated by men or women, and no previous welding experience is necessary. Workers are securing 1000 or more studs in eight hours without difficulty.

HOW TO DO IT—

Problem:

SECURING STUDS TO HOLD INTAKE VENT COVERS ON INDUSTRIAL FURNACE.



Former Method--Drill hole through flange, tap hole, insert bolt, and hand-weld head of bolt. Process took too long.

Present Method--Saves more than 40% of the time of former method. Studs are quickly secured with equal strength and accuracy.

After layout and center-punching the studs are welded to the flange. Gasket and sheet metal cover are then installed on top and secured with nuts.

Portable Nelson "gun" well liked because stud welding can be done on furnace while assembling.

Do you have a problem like this stud welding can solve?

FOR DETAILS AND CATALOG WRITE:

NELSON SPECIALTY WELDING EQUIPMENT CORPORATION
Dept. H, 440 Peralta Avenue
San Leandro, California

EASTERN REPRESENTATIVE: Camden Stud Welding Corp., 1416 South Sixth Street, Camden, New Jersey

The Finest Insurance

FOR HEATING AND PLUMBING SYSTEMS AND FOR YOUR OWN REPUTATION

The STREAMLINE Fitting is the only solder type fitting on the market in which POSITIVE PROOF of a leak-proof joint can actually be seen without resorting to a pressure test.

When the plumber or steamfitter makes a joint with a STREAMLINE Solder Fitting and Copper Pipe, he can tell at a glance that the joint is leak-proof and permanently tight, by the appearance of the solder as a complete ring at the end of the fitting.

All that is necessary is for him to comply with certain simple rules . . . and the result is automatically certain. There is no guesswork about it. STREAMLINE Solder Fittings carry with them their own indisputable proof of a permanent, perfectly bonded joint.

The owner who buys a copper job actually buys long-life insurance for the comfort and livability of his investment. He procures a piping material that is highly resistant to rust and clogging . . . a system that will, under normal conditions, give him life-long, efficient service. Even in extremely abnormal water conditions, copper is generally the best in the long run.

The plumbing contractor who puts in a copper job, installs a material that is the most practical and handy to use . . . no back-breaking threading and lifting . . . less equipment to carry . . . less weight, and less space required. There need be no expensive "come-backs". . . the job is right and it stays right.

STREAMLINE products are advertised by this Company for the use of experienced plumbers and steamfitters . . . they are procurable only through legitimate plumbing jobbers.

PLAN ON USING STREAMLINE FOR YOUR FUTURE JOBS.

STREAMLINE

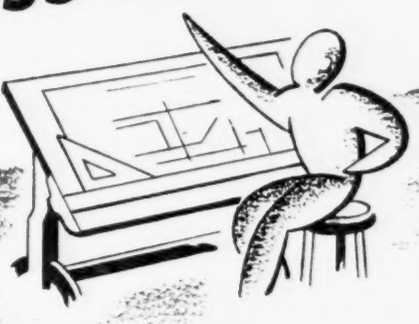
TRADE MARK REG. U. S. PAT. OFFICE

COPPER PIPE AND FITTINGS

You'll Get HIGHER EFFICIENCIES, BETTER PERFORMANCE

with AMP

SPECIALIZED CONTROLS and REFRIGERATION ACCESSORIES



Today AMP Corporation is manufacturing millions of highly specialized units for the Army and Navy, many of which were originated by AMP engineers. Tomorrow, all of our extensive manufacturing and research facilities will be at the service of industry.

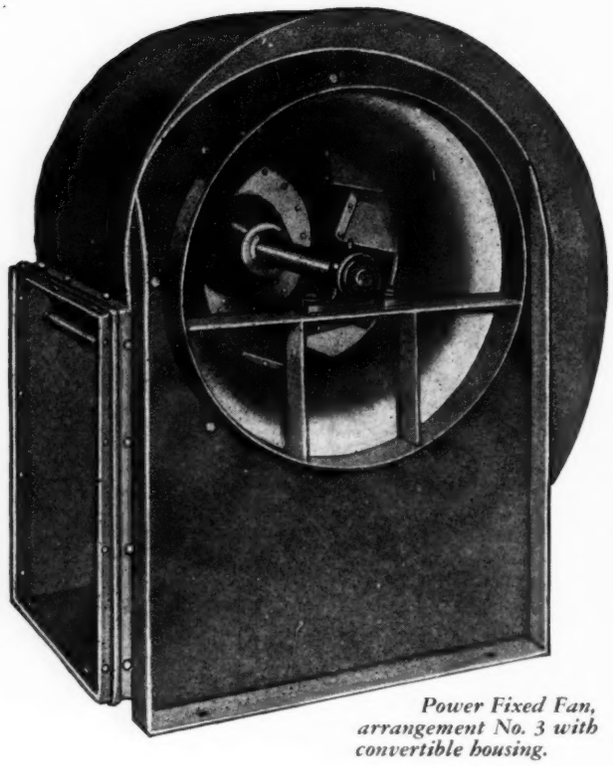
AMP control devices and refrigeration systems, based on new and proven patents and improvements, offer manufacturers, processors, and users of existing equipment — greater efficiencies at lower cost in three basic groups:

1. **Refrigeration, air conditioning, and processing flow controls**
2. **Refrigeration specialties**
3. **Beverage carbonator-refrigerating dispensers**

AMP specialties enable the equipment manufacturer to increase the salability of his product through new principles of control in refrigeration — the processing industries to secure higher efficiency, greater sanitation, and higher utilization of thermal energy. In the beverage dispensing field, AMP carbonation has been acclaimed the finest ever achieved.

It will pay you to investigate the technological advances made by AMP engineers during the past few years and how the results achieved may well solve your own particular problems. Write today.

AMP **CORPORATION**
2921 LOCUST ST. • ST. LOUIS 3, MO.



Power Fixed Fan, arrangement No. 3 with convertible housing.

Meeting Present Day

HEATING . . . VENTILATING AND AIR CONDITIONING

Demands

FOR SIMPLICITY... EFFICIENCY...FLEXIBILITY

Massachusetts Squirrel Cage Fans

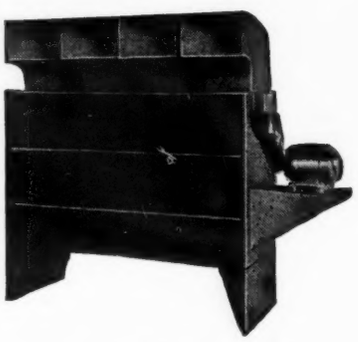
are suitable for all types of commercial and industrial Air Conditioning systems. Slow speed, quiet and efficient. Available in wheel diameters 13½″ to 86″, single and double width.

Massachusetts Power Fixed Fans

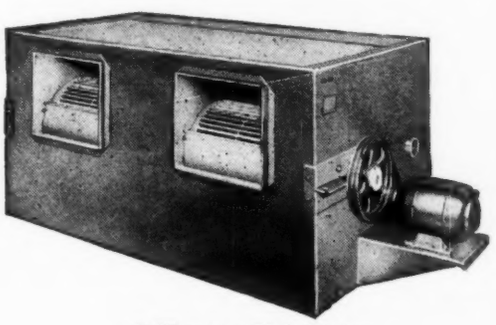
have wheels with backwardly inclined floats and self limiting horsepower characteristic. Convertible type housings in wheel sizes up to 36″, and built up cycle housings over 36″. Housings are steel plate rigidly reinforced. Wheels are die-formed.

Massachusetts Blower Type Unit Heaters

Full range of sizes and capacities for floor, or ceiling, or special mounting arrangement. All are available with four types of converters. Can be furnished with filter and damper sections.



Floor Type Unit Heater



Ceiling type Unit Heater without discharge cowls.

★ ***Write today*** for catalogs of Massachusetts Power Fixed Fans and Massachusetts Squirrel Cage Fans.

MASSACHUSETTS BLOWER DIVISION

The BISHOP & BABCOCK *Mfg. Co.*

4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

Location: *Bellevue, Pa.* Architect: *Lawrence Wolfe*
Heating Contractor: *Geo. F. Higgins Co.*

HEAT AND HOT WATER FOR $2.45 PER MONTH PER APARTMENT!

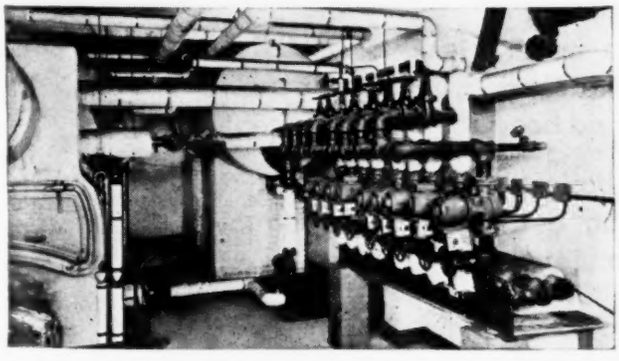
Builders today are specifying the B & G Monoflo Heating System for the common sense reason that it offers *more comfort for less money!*

The fuel consumption record of the modern 26 suite apartment shown above offers ample confirmation of Monoflo heating economy. This 3065 sq. ft. installation is stoker-fired, with temperature control effected by an outside type thermostat. Service water is heated the year around by a B & G Tankless Heater.

The accurate balancing of heat input and heat loss achieved by the Monoflo System means that *just enough* fuel is burned. The system never overheats in mild weather, yet has plenty of reserve when the thermometer hits bottom.

Easily zoned for sectional temperature control

The photo below of another installation shows how a B & G Monoflo System can be zoned to give each tenant individual control of his heating. The delivery of heat to each apartment is controlled by a B & G Booster Pump, operated by a room thermostat. An alternate method is to employ a single Booster to provide circulation, with a thermostat-operated B & G Motorized Valve installed in each zone circuit to control the flow of hot water.



THE BASIC EQUIPMENT

The B & G Monoflo System accomplishes its results with simple inexpensive equipment and is therefore easy to design and dependable in operation. The basic units are a B & G Booster, B & G Flo-Control Valve, B & G Monoflo Fittings and a B & G Water Heater of the size and type best suited for the job.

In addition, Monoflo *single main* piping cuts material and labor cost—makes a neater, space-saving installation.

SEND FOR B & G HANDBOOK

Full instructions for the design and installation of this Forced Hot Water Heating System is given in the B & G Handbook. This authoritative manual also covers the installation of service water heating systems. Your copy will be sent if you will write to us on your regular business stationery.

BELL & GOSSETT COMPANY
Dept D-4, MORTON GROVE, ILLINOIS
Canadian Licensee: S. A. Armstrong Ltd., 115 Dupont St., Toronto

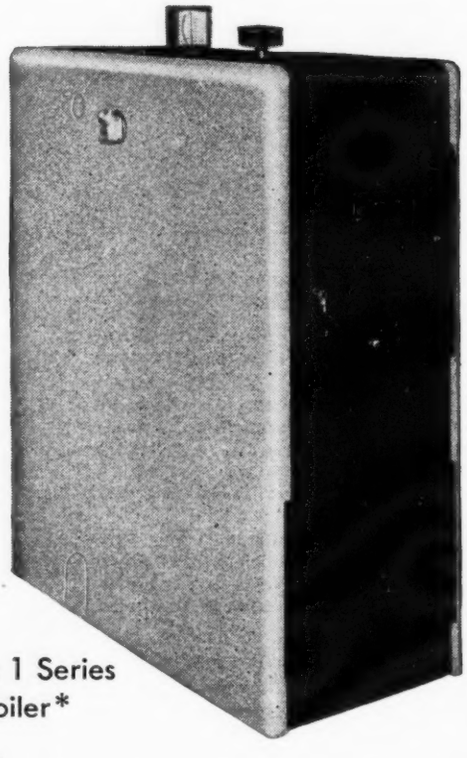
FORCED HOT WATER HEATING SYSTEMS

Designed

FOR **SMALL HOMES!**

FOR REMODELING
TODAY!

FOR NEW BUILDING
TOMORROW!



The National No. 1 Series
Heat Extractor Boiler*

This compact and efficient boiler offers the features you've been seeking for small home installations. It's designed for coal, oil or gas firing and easily convertible from one to the other.

Water legs extended to the bottom make it easy to install on wooden floor of utility room or kitchen without expensive fireproofing. Minimum floor space and head room requirements.

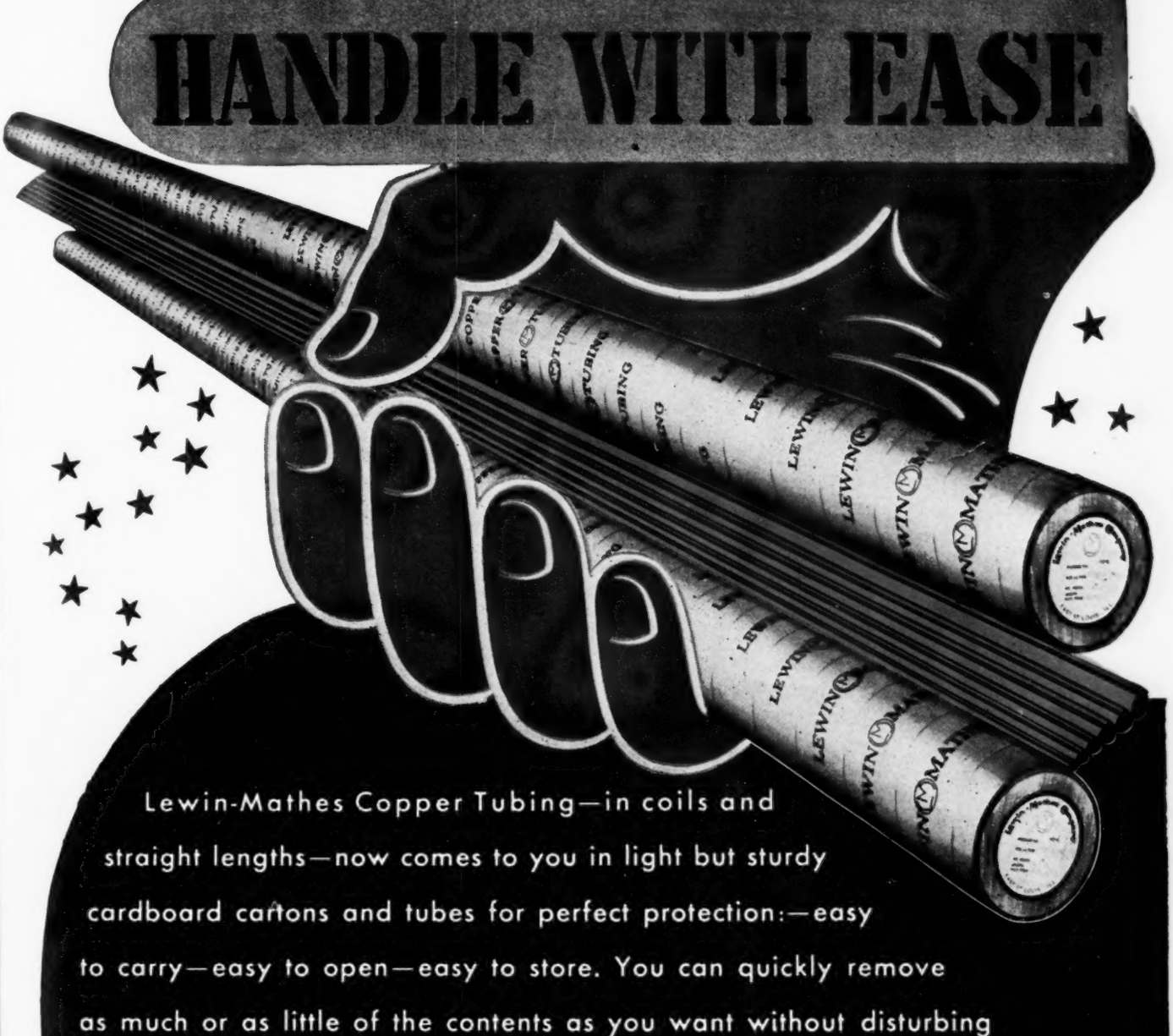
Another feature, unusual in small boilers, is the availability of a copper coil water heater assuring delivery of an adequate supply of hot water, winter and summer.

** Furnished with jacket when WPB permits.*

NRC
NATIONAL RADIATOR PRODUCTS

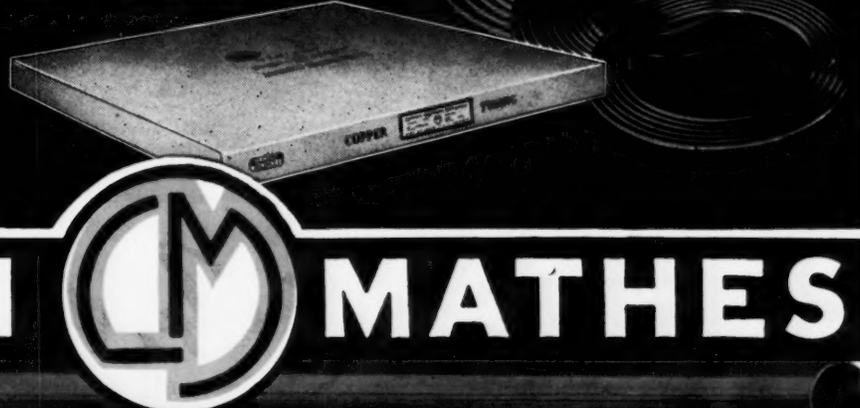
The NATIONAL RADIATOR Company
JOHNSTOWN, PENNSYLVANIA

HANDLE WITH EASE



Lewin-Mathes Copper Tubing—in coils and straight lengths—now comes to you in light but sturdy cardboard cartons and tubes for perfect protection:—easy to carry—easy to open—easy to store. You can quickly remove as much or as little of the contents as you want without disturbing the rest.

LEWIN-MATHES
SEAMLESS COPPER TUBING

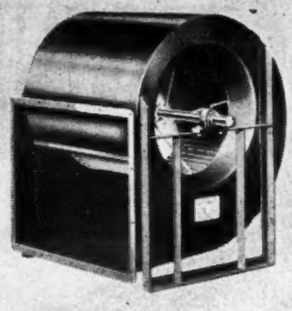


LEWIN MATHES

LEWIN-MATHES COMPANY · · SAINT LOUIS, MISSOURI

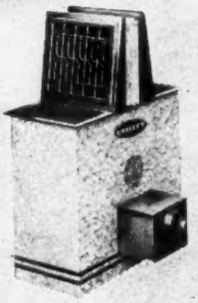
UTILITY Appliance Corp.

Air Cooling, Ventilating and Gas-Fired Heating Equipment



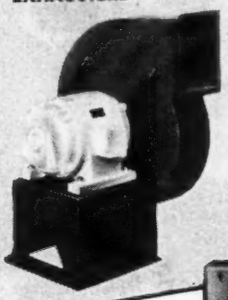
HEAVY DUTY BLOWERS

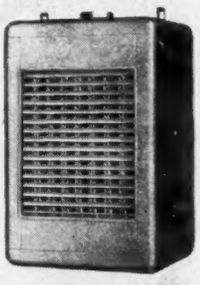
AIR COOLERS



FLOOR FURNACE

EXHAUSTERS



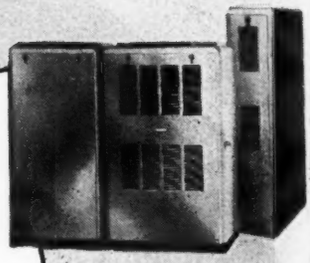


UNIT HEATERS

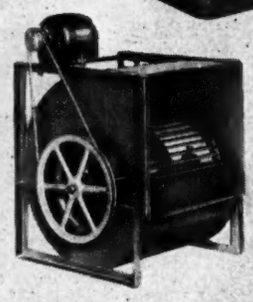
UTILITY

The UTILITY Trade Mark is your assurance of proven, dependable equipment for air cooling, ventilating and heating . . . in residential, commercial and industrial buildings. These appliances include the best features of modern design and construction . . . will be produced in assembly-line plants.

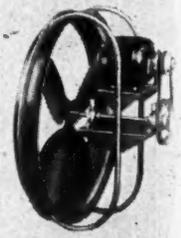
Utility Evaporative Air Coolers, Blowers and Fans are now available in limited quantities. We hope to make gas-fired heating equipment available in the fourth quarter of 1945. Keep in touch with us for developments.



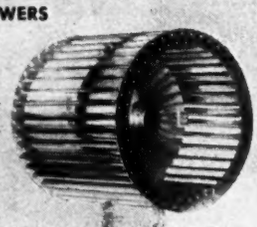
FORCED-AIR FURNACES



STANDARD BLOWERS

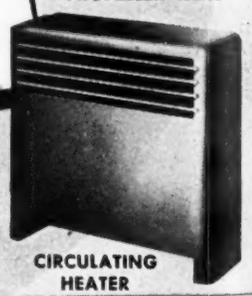


PROPELLER FANS



BLOWER WHEELS

The Utility Factory..more than five acres of plant floor space



CIRCULATING HEATER

UTILITY Appliance Corp.

Formerly Utility Fan Corporation

4851 South Alameda Street, Los Angeles 11, California

Speaking of Saving Fuel-

What makes or breaks a heating system? It's the steam traps and temperature control. Start your check-up in the boiler room, and follow your lines to see that there are drips enough to keep the steam dry all the way.

Tune up all radiators and unit heaters with efficient steam traps and temperature control and see that every trap on every radiator is working.

Check your hot water service for proper traps and temperature control.

A phone call will bring a Sarco representative to help you check up your heating system and to suggest inexpensive, easily installed Sarco steam traps and temperature control that will accomplish a saving and an improvement in service at the same time.

There's lots of talk, but here is something you can do about it, now!

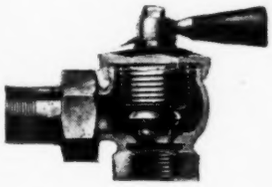
Perfect heat usually costs less in the long run. Ask for a Sarco representative now.

TYPE H

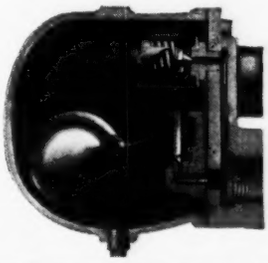
SARCO
RADIATOR TRAP

The standard for nearly thirty years. Still made with the famous Sarco bellows, formed in our own plant from flat blanks and helically corrugated on special machinery developed by us.

COMPANIONS TO THE SARCO RADIATOR TRAP



Sarco Radiator Valve is protected against stem leakage by a standard Sarco bellows.



Sarco Float-Thermostatic Traps are standard for end-of-main and riser drips and fan type heating surface. Automatic air by-pass makes air binding impossible.

Sarco Boiler Return Traps automatically return all condensation to boiler, eliminating danger of waterlogged return lines.

Sarco Air Eliminators expel all air from vapor systems at one central point in the basement to expedite heating up.

SARCO SAVES STEAM

SARCO COMPANY, INC., 475 FIFTH AVENUE, NEW YORK 17, N. Y.

SARCO CANADA, LTD., 85 Richmond Street, West, TORONTO, ONTARIO

Represented in Principal Cities

39

Give any living thing the right "growth conditions," and it will flourish. Put *you* in the right atmospheric medium—temperature just right, humidity just right—and you, too, will thrive . . . just like those moulds that produce life-saving penicillin in made-to-order air by Worthington.

Today, we're getting penicillin in the quantities we need, with the help of this better air conditioning. Tomorrow, *you'll* feel better in stores, restaurants, theatres, offices, factories that use up-to-date Worthington air conditioning to put people in top spirits, top efficiency.

Since Worthington makes so many of the "vitals" of air conditioning and refrigeration systems—compressors, engines, turbines, condensers, pumps, valves, fittings—it is well positioned to study what makes air conditioning most successful . . . at lowest cost.

Many wartime applications have proved that Worthington's happy *integration* of the various components—in unit conditioners or completely-engineered systems—is extremely vital for complete success . . . a reason why *there's more worth in Worthington.*

Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey. Specialists in air conditioning and refrigeration machinery for more than 50 years.

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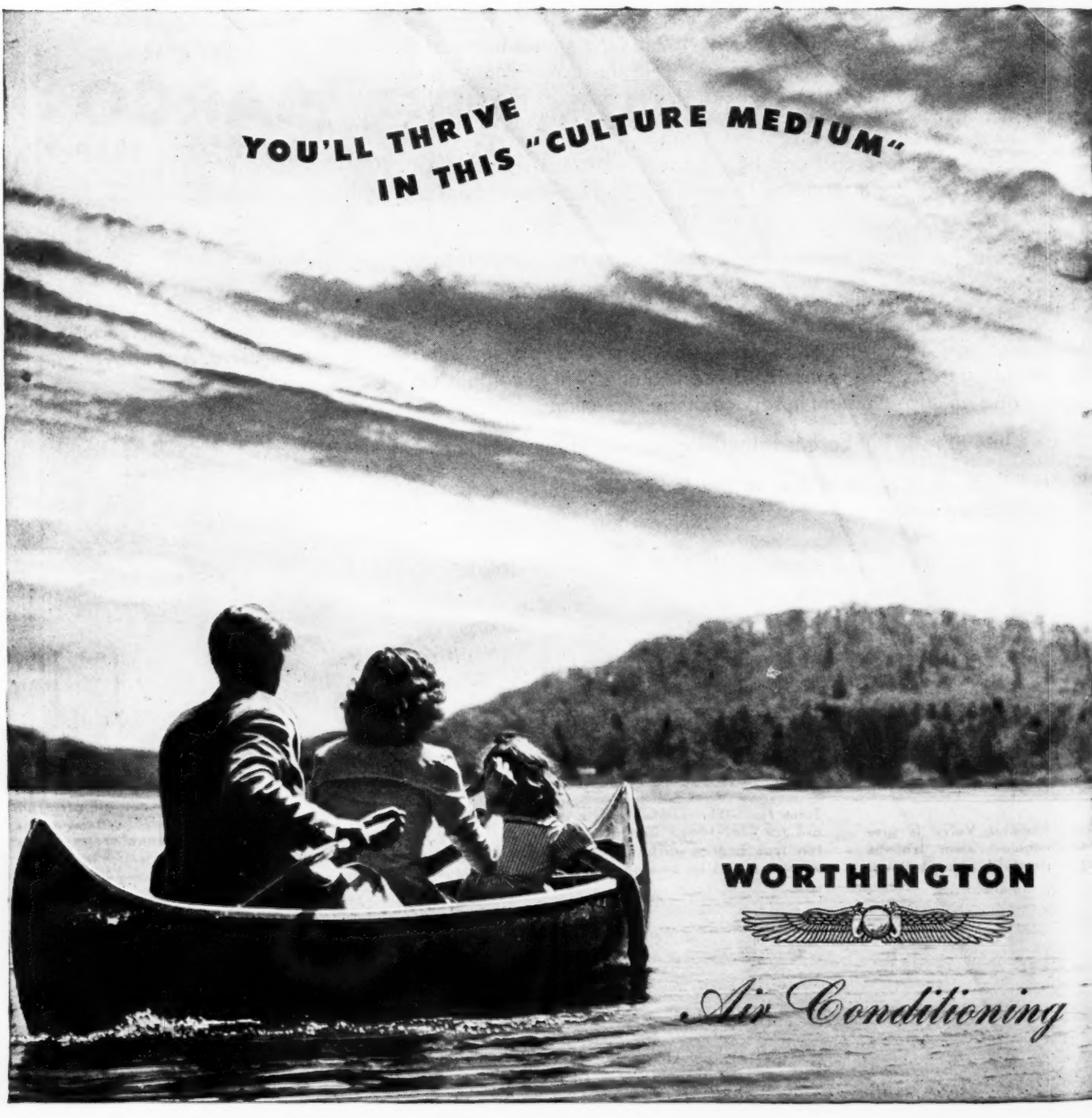

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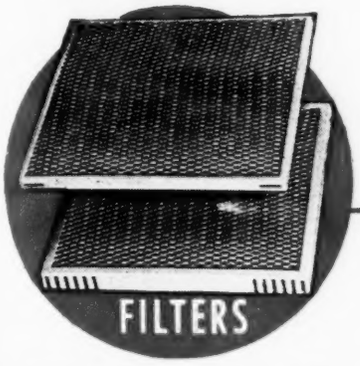

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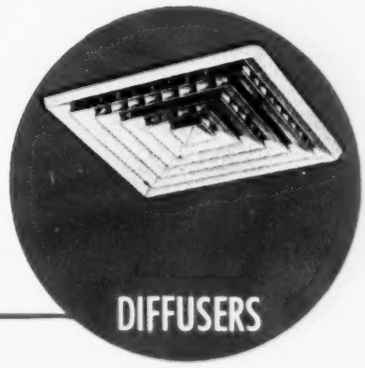

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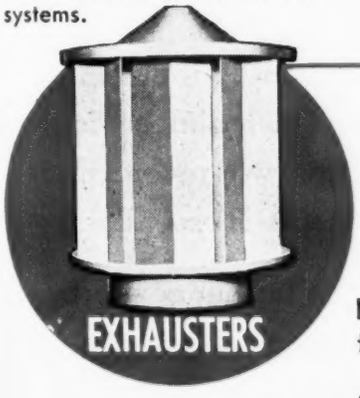

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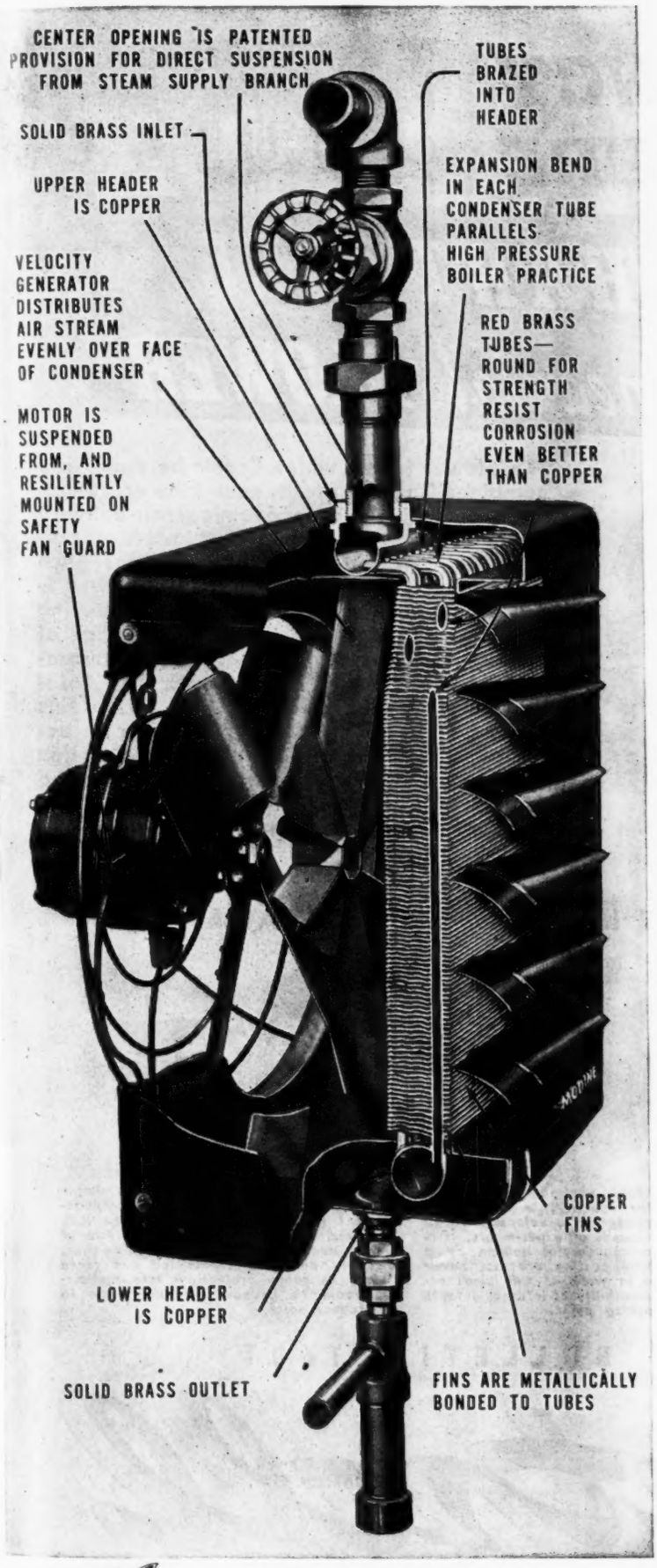
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TUBES BRAZED INTO HEADER
SOLID BRASS INLET
UPPER HEADER IS COPPER
EXPANSION BEND IN EACH CONDENSER TUBE PARALLELS HIGH PRESSURE BOILER PRACTICE
VELOCITY GENERATOR DISTRIBUTES AIR STREAM EVENLY OVER FACE OF CONDENSER
RED BRASS TUBES— ROUND FOR STRENGTH RESIST CORROSION EVEN BETTER THAN COPPER
MOTOR IS SUSPENDED FROM, AND RESILIENTLY MOUNTED ON SAFETY FAN GUARD
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LOWER HEADER IS COPPER
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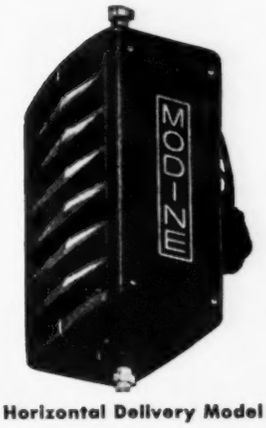
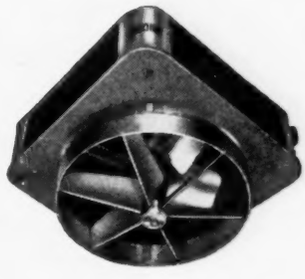


Horizontal Delivery Model



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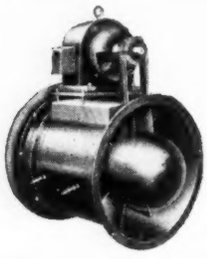
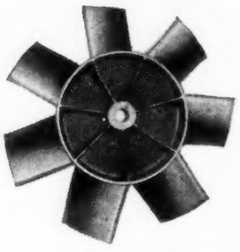


Tremendous structural strength and precision of design and production characterize both the Direct-Drive model (shown above) and the Belt-Drive model (below). For instance, a special tube section is set in at the impeller tips. It is specially formed to insure exact, uniform clearance, essential to full air delivery, safety and quiet operation.

THE IMPELLER



Most important part in a Vaneaxial Blower is the impeller, or wheel. The Hartzell impeller was developed through literally thousands of experiments. It is produced in commercial volume by a new, precision casting process, never before used in work of this kind, reducing the possibility of internal defects to the vanishing point.

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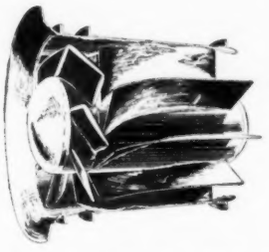

Note in this view the sturdy, simple design, which means fewer complications to cause trouble. Note the long vanes, which straighten out the flow of air, and the heavy, one-piece impeller. Every detail is streamlined and there are no sharp projections into the airstream to impede air-delivery or to produce noise.

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Hartzell

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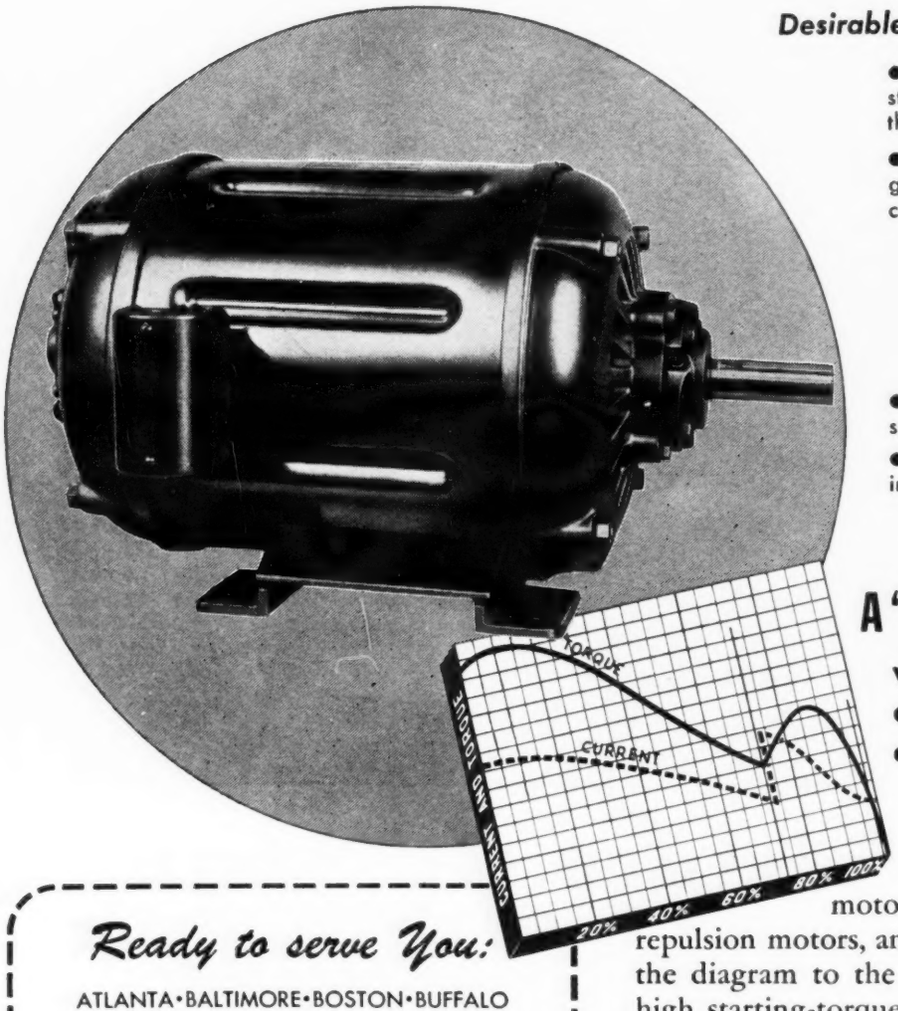

Desirable Features of Repulsion Motors

- High starting-torque enables them to start high-inertia loads and accelerate them smoothly.
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plus

Desirable Features of Induction Motor

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- Flat efficiency curve over wide operating range.

means

A "General-Purpose" Motor

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Wagner repulsion-start induction motors, as their name implies, start as repulsion motors, and operate as induction motors. As the diagram to the left indicates, the motors have a high starting-torque, yet have the lowest starting-current of any type single-phase motor.

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Filters that are designed to "stay new" longer

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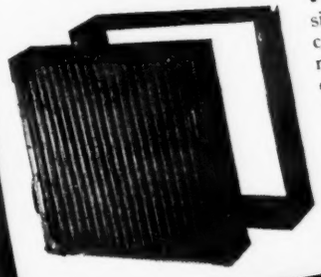

VISCOUS PANEL FILTER: Scientifically designed for all applications where use of a viscous type filter is indicated. The filtering medium consists of a series of alternately crimped layers of galvanized screen cloth and woven mesh. When coated with the proper filter oil, this medium forms an unusually efficient filter. The arrangement of the medium in the metal cell provides extremely large dust-holding capacity. Cells are held tightly in box-like supporting frames and sealed against air leakage by means of cam-type locking latches.

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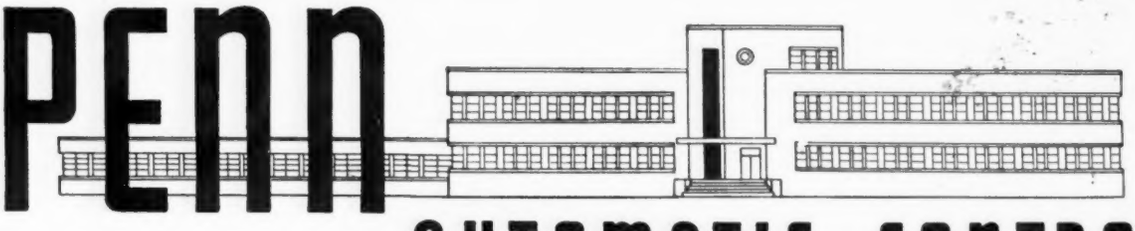

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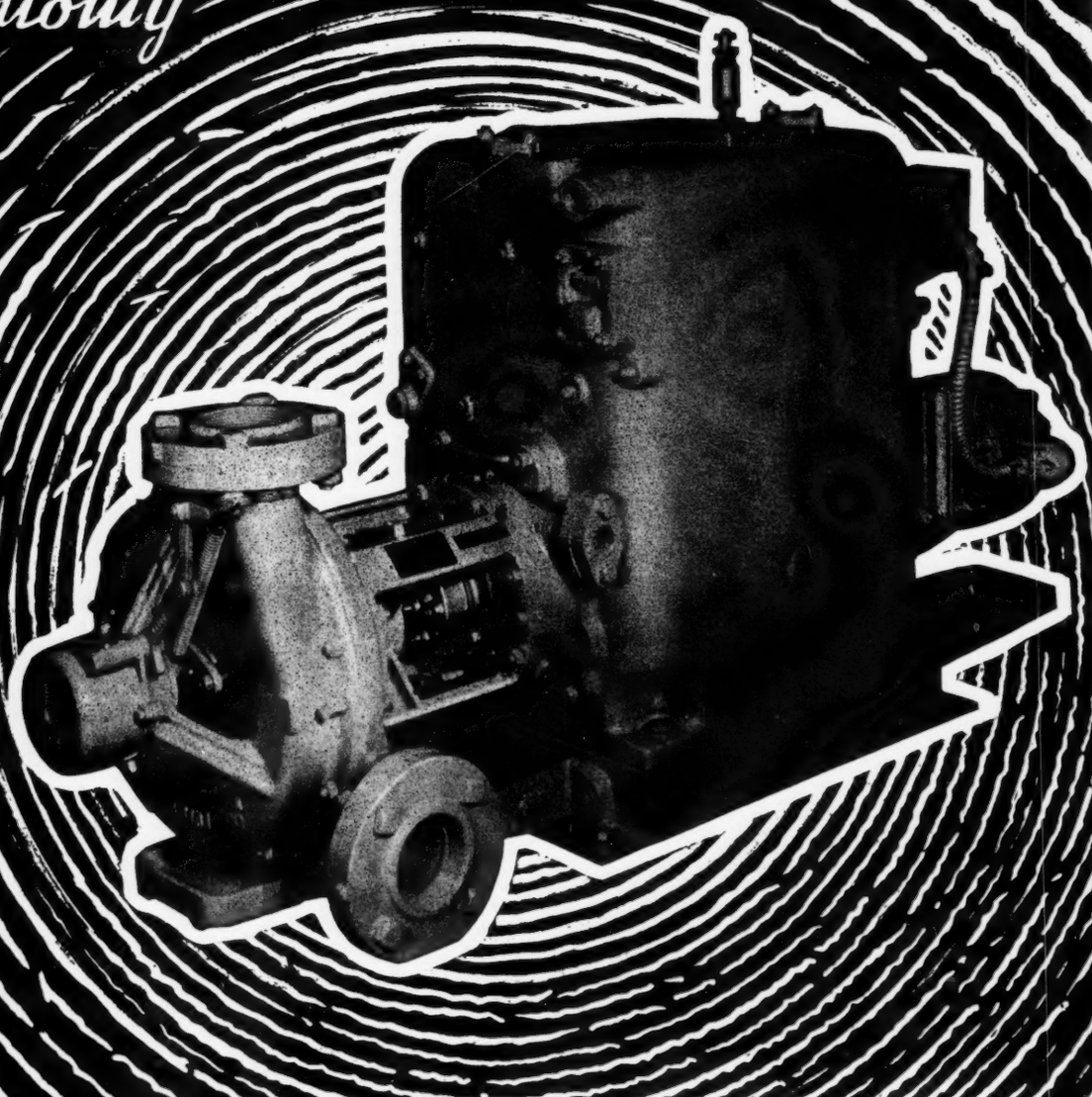

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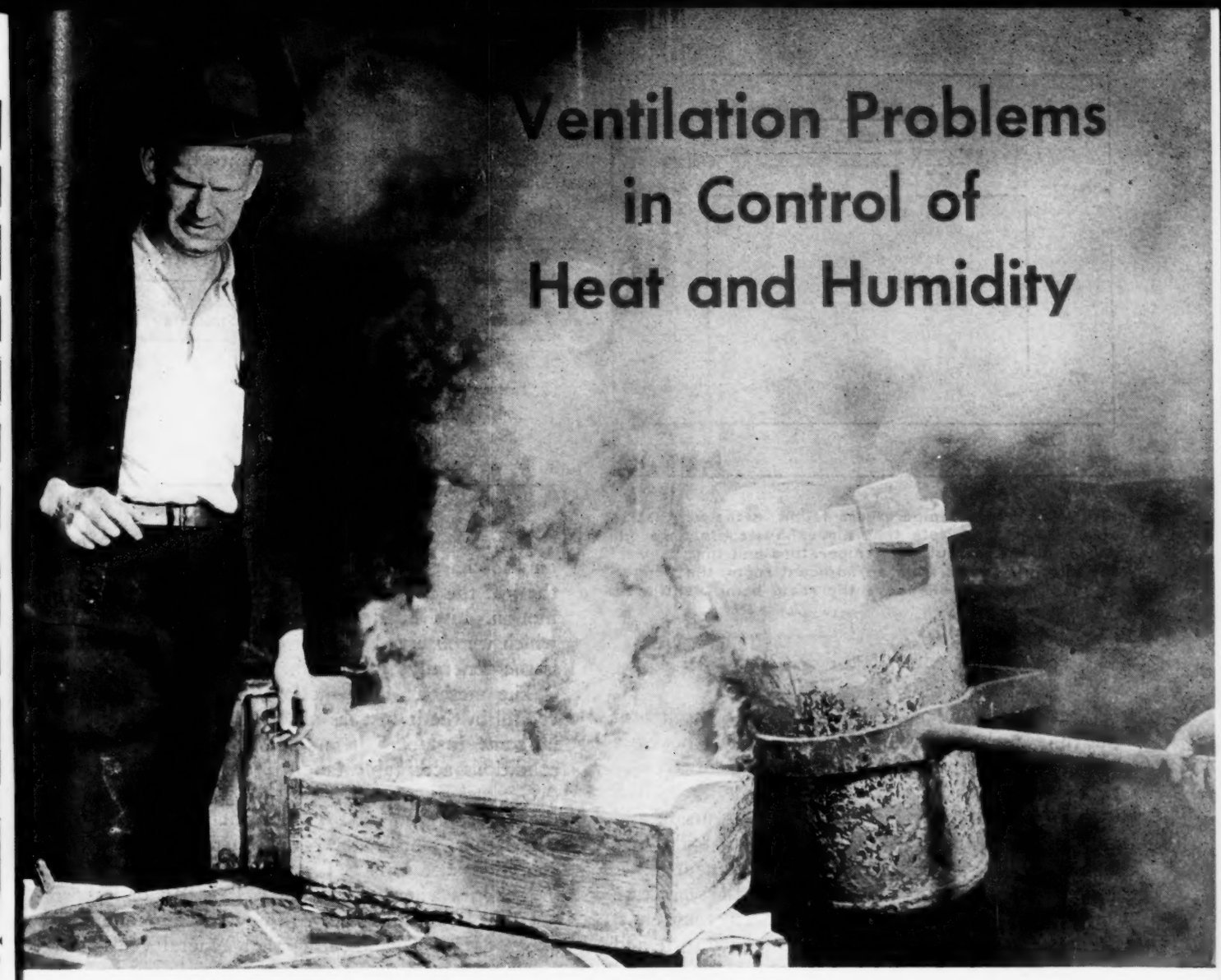

Ventilation Problems in Control of Heat and Humidity

JOHN B. SKINNER, WILLIAM M. PIERCE and ANDREW D. HOSEY

Engineers, Massachusetts Division of Occupational Hygiene*

EXPOSURE to excessive heat and humidity is an industrial hazard generally recognized as undesirable. There is sufficient non-industrial experience in exposure to excessive heat in the summer months to create a widespread consciousness of the discomfort and adverse effect on physical activity. The effects of moisture content and motion of the air on comfort are also widely appreciated. Few industrial hazards are as well recognized, yet little is done in the way of adequate control.

Conditions of excessive heat and humidity augment the pulse rate and body temperature, tending to an increase in sickness, mortality, accident and absenteeism rates, and to a decrease in physical activity and work output.

The "effective temperature" index provides a means of correlating various combinations of temperature, humidity and air motion so that comparisons are possible. Published studies indicate that, for people doing light sedentary work, there is a significant increase in the body temperature and pulse rate where an effective temperature of 86.5F is exceeded.

In studies made by us in Massachusetts from 1941 to 1944 effective temperatures in excess of 86F under design conditions were considered excessive and control measures were recommended.

The procedure which we have followed in estimating heat and humidity conditions in industrial plants is as follows. Measurements are made of the dry and wet bulb temperatures of the outside air, of the working area, of the inlet air and of the exit air. Air motion is determined by velometer or kata thermometer in the working area. The difference between the dry bulb inside and outside enables us to calculate the dry bulb temperature in the working area under design conditions which we designate as "average worst expected conditions." These tem-

*Mr. Hosey is no longer with the Division.

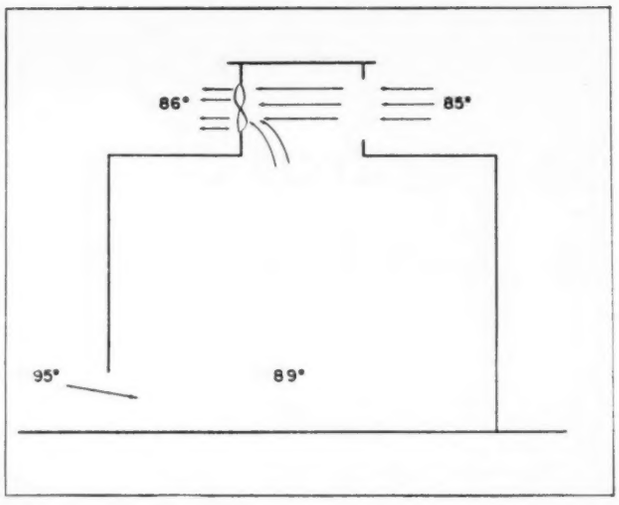

Fig. 1. Dry bulb temperatures found in the ventilation of a dye house. Note that air exhausted is only one degree above the outdoor temperature and that some of the inlet air comes from an adjacent room, the temperature of which is 6F above the room being ventilated.

peratures are not exceeded more than 5% to 8% of the time during a cooling season of 1200 hours in June, July, August and September for an average year in a given area.

From wet and dry bulb temperatures inside and outside, the gain in moisture is calculated. This moisture gain is added to the moisture content under design conditions in order to give the moisture content inside the plant under design conditions. From the inside calculated dry bulb temperature and the calculated moisture content under design conditions, it is possible to get the wet bulb temperature in the working area under design conditions from a psychrometric chart.

The dry bulb and wet bulb temperatures thus obtained, together with the air motion, enable us to predict the effective temperature in the working area under design conditions. In practice, measurements were made on days when the temperature was over 80F when the natural and mechanical ventilation were the same as would prevail under design conditions. Measurements were made of temperature and humidity of inlet and exit air to assist in detecting poor practices in ventilation.

In addition, measurement is made of the radiant heat by means of a globe thermometer which consists of a copper ball 6 in. in diameter and painted matte black. A thermometer is so placed that the bulb is at the center of the ball. Temperature is read after 20 minutes. In some cases it was found that the worker's discomfort was due to radiant heat and not to the air temperature, indicating control of the former, rather than increased ventilation.

The following methods of control were found to be effective in relieving excessive exposures to heat and humidity. Generally a combination of methods is required.

Air Motion. The use of circulating fans is a practical means of enhancing comfort. An examination of the effective temperature chart shows that increasing the air motion will lower the effective temperature except at very high temperatures and humidities.

The following examples indicate the effect of air motion on effective temperature.

AVERAGE WORST CONDITIONS

Plant	Operation	DB F	WB F	"E.T." Still Air	"E.T." Moving Air
1. Steel	Drop forge	110	80	89	88 at 200 fpm
2. Textile	Tenter	98	81	87	85 at 300 fpm
3. Steel	Drop forge	116	83	91	90 at 400 fpm
4. Plastics	Molding	102	77	86	84 at 300 fpm
5. Lamp	Sealing	93	76	83	81 at 200 fpm

It can be seen from these figures and from trial on the chart that the nearer we get to 100F E.T., the less the benefit obtained from increasing the air motion. Five hundred fpm is the maximum velocity which we observed without complaints, but 200 fpm is the generally accepted maximum.

The method of air motion alone was never successful in the industries observed in our studies, but in some instances it makes otherwise undesirable conditions acceptable (Plant 2 above.).

General Exhaust Ventilation. An improvement on the foregoing method is that of general exhaust ventilation. This method is impractical where design conditions are 86F E.T. or more, but is beneficial in localities where the design E.T. is 84F or less.

Of 70 U. S. cities, only 12 have design conditions above 84F E.T., indicating that general ventilation has quite general application. Cities which have design effective temperatures of 85F are Mobile, Ala., Tampa, Fla., New Orleans, La., Kansas City, Mo., Wilmington, Del., Oklahoma City, Okla., Charleston, S. C., and Galveston, Tex., while Phoenix, Ariz., Shreveport, La., Dallas and San Antonio, Tex., have design E.T. of 86F. The bringing in of cool outside air will produce considerable relief. Exhaust fans should be installed to remove the hot air from the roof area, with the air inlets so located as to eliminate short circuiting. In the case of exhaust fans located in roof monitors, it has been found that workers will open adjacent windows, thus allowing the fans to handle cool outside air, rather than exhausting the heated plant air. It is also very common to have the inlet air pulled in from adjacent hot rooms. (Fig. 1.)

An example of poor location of the air inlets was found in a sugar refinery, where the pan room was located directly above the mixer room and was connected by a stairwell. It was necessary for workers to be continually in the pan room, but not in the mixer room. Air coming into the pan room from the mixer room was 17F above the outside temperature. It was recommended that a stack be built over the stairwell, completely enclosing it, with a door to permit such passage as might be required.

Based on our measurements, the average worst conditions in the pan room were:

Originally	DB F	WB F	ET
Mixer room (hot air entering pan room) by stairwell	109	89	93
After Changes			
Mixer room (air removed by stack)	98	76	84

In this case very great improvement was made without any additional fan capacity.

The method of general exhaust, the one most usually employed, is most effective when fans are so placed that they remove the warmest air in the room. In one radio tube manufacturing plant, the fans were in the wall 10 ft from the ceiling. Temperature at the ceiling was 130F and the air being exhausted by the fans was only 105F, this being due in part to open windows adjacent to the fans.

Supplied Air. In order to direct cool air to the desired location, air is sometimes supplied either in conjunction with an exhaust system or alone. It is generally convenient to bring the air ducts along the ceiling which, however, is the hottest part of the room. One installation of this type, with uninsulated duct work located in the hot ceiling area, was found to be delivering air to the work area at a temperature 11F above the outside atmosphere. It was found that, by suitable insulation, the temperature of the inlet air could be decreased so that there was only a 2F rise in the duct work. (Fig. 2.)

One installation was observed in a plastics plant where the fresh air ducts ran along the floor. The duct work was covered with a wooden platform on which the workers carried on their molding operations. In this particular case the air was delivered to the workers through openings located in the platform. Dampers and deflectors were provided so that workers could adjust the air to their own comfort. Some of the workers preferred to let the cool outside air impinge directly on their bodies, while others, who felt that drafts were bad for their health, kept the inlet dampers shut or deflected the supply into the general room air. Worker control of cooling air by systems such as this is sometimes desirable because of variations in individual preference as to working temperatures and air motion.

Water spray cooling systems will reduce the amount of air which has to be introduced to produce the proper cooling. A decrease of 10F in the dry bulb temperature will cause a reduction in the effective temperature of about 5F, the humidity added in the process minimizing the decrease in effective temperature. Such systems are not effective in very humid weather and are more expensive than the simpler methods previously described. There are cases, however, where they are the best solution to the problem.

In one plant a dehumidifying system was observed in which outside air was passed through silica gel and discharged into the room. An effective temperature of 77F in the plant was obtained under design conditions when the outside effective temperature was 82F. No heat producing operations were carried on, the heat problem being one of overcrowding.

A number of installations were observed where exhaust and supply air were used in conjunction. The chief fact to bear in mind with these systems is that the ventilation rates of the two systems are not additive. In one plant an effective temperature of 88F was predicted under average worst conditions. Supply air fans were provided to deliver an amount equal to the air removed by the exhaust fans, but no improvement could be observed in the working temperatures, and the effective temperature under average worst conditions remained 88F.

A rather unique ventilating system was seen in the dye house of one textile mill, where air was supplied by a system which distributed outside air to various outlets in the room, the air being heated in winter. Canopy hoods located over the dye vats were connected to natural draft stacks, the construction being entirely of wood. The fan delivered air at a sufficient rate to maintain a slight pressure within the room, so that steam and hot air were forced up the natural draft stacks and, by varying the fan speed, the steam level inside the canopy hood could be regulated to keep dripping to a minimum. The system had the advantage that it could be used in winter to exhaust the steam without the production of fog, an undesirable condition which is prevalent in those dye houses where exhaust systems alone are used and make-up air enters through open windows.

Local Exhaust Ventilation. Where the source of heat is concentrated over small areas, local exhaust hoods are effective. These hoods should be insulated to prevent reradiation. The removal of steam from hot tanks is especially beneficial, preventing the increase of both humidity and temperature.

The remaining methods do not involve ventilation but are important in making working conditions bearable in many cases where the use of ventilation alone would be too expensive.

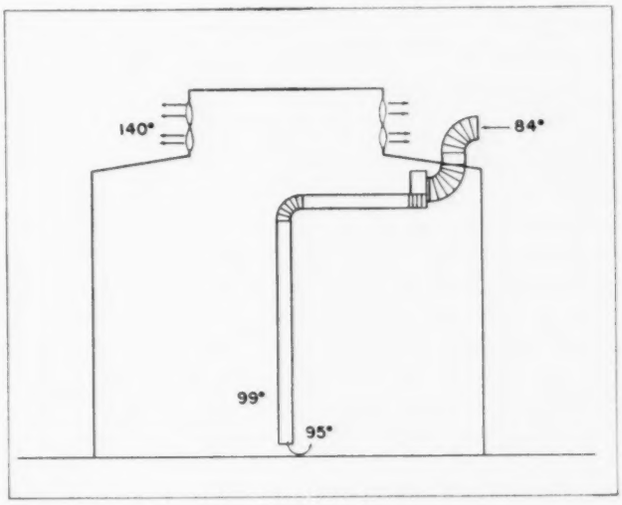

Fig. 2. Dry bulb temperatures found in the ventilation of a workroom. Inlet air is heated 11F in passing through the inlet ducts, while the rise in temperature from the duct to the workers amounts to only 4F.

Reduction of Radiant Heat. In a case where it was found that the problem was not that of excessive air temperature, the effective temperature under average worst expected conditions was only 84F, yet the heat was almost unbearable. The cause of discomfort was radiant heat. Using the globe thermometer already described, temperatures of 150F were obtained. In such a case, increase in ventilation would be of little benefit beyond the cooling effect of air motion, and this effect is limited. Preventive measures should be directed toward control of the radiant heat. The most common method is provision of suitable baffles placed between the high temperature source and the workers. Radiation from installations such as driers can be prevented by proper insulation.

Enclosure of Wet Processes. In a plant where enclosed pressure kettles were substituted for open-type stock dyeing tubs, the effective temperature was reduced by 5F, although the decrease in the dry bulb only amounted to 3F. The results are shown below and represent average worst expected conditions in a textile plant.

Condition	DB F	WB F	Effective Temperature
Open tubs	100F	89F	92
Enclosed vessels	97F	83F	87

Enclosure of any humid process is to be preferred to an open one in controlling excessive heat.

Insulation. In both rubber and plastics molding there is a considerable hot surface which can be insulated. All of the piping and a great amount of the press surface can be so treated, and the saving in fuel cost will easily pay for the installation. In the plastics industry, insulation of the molds is difficult because of the complex nature and number of moving parts, but internally heated gas molds are being developed which will greatly minimize the heat problem. This question is so important that it should be given consideration in plant design and location, as well as in equipment and mold design.

Adjustment of Working Hours. Adjustment of working hours to avoid the hotter part of the day may have merit. In one rubber molding room, work was started two hours earlier in the morning to permit the men to leave before the hottest part of the day. In a number of plants the men quit at noon when the temperature rose much above 90F.

Cooling of Roof. In two cases, water was sprayed on the roof to cut down the solar heat gain and reduce the air temperature near the ceiling.

Use of Salt. While the use of salt in the drinking water does nothing toward heat reduction, it is of value in combating its ill effects. The medical profession has for some time recognized the desirability of increasing the salt intake of workers subjected to high temperatures, the purpose being to replace the salt lost by excessive perspiration. Salt tablets, provided in dispensers located adjacent to drinking fountains, are used quite extensively. Some complaints are made of nausea from the tablets, generally caused by the worker's taking more than one tablet at a time. In some factories the workers obtain the salt from the plant dispensary, and in others the drinking water supply is salted. We have found the enteric-coated salt tablets very effective for our own use when making surveys of hot industries. These tablets do not produce nausea and theoretically do not dissolve until they reach the intestine. They were found quite necessary, even when our exposure to the hottest conditions might be for only two or three hours of the day. Some degree of acclimatization was noted. In spite of a greater exposure, the degree of discomfort experienced in the second year of the study was much less than in the first, an effect probably due to use of the enteric-coated salt tablets.

Examples of Possible Controls

Case 1. This work involved excessive exposure in front of a cotton tenter. Hot, moist air blew out of the front of the tenter, which was uninsulated. Conditions were such that the department shut down for an average of ten days a summer.

The working environment under average worst conditions was:

DB F	WB F	Effective Temperature
103	85	90

The front of the tenter was insulated and baffled so that the air did not blow out on the operator. A local exhaust hood was installed over the tenter opening to remove the hottest air. Supply air was delivered directly to the operator, and circulating fans were provided to give air motion. Salt tablets were provided.

Conditions under average worst conditions were found to be:

DB F	WB F	Effective Temperature
97	79	83 at 300 fpm

The plant operated without shutdown during the abnormally hot 1944 summer season.

Case 2. This plant had to shut down a number of times due to excessive heat. The average worst conditions were found to be:

DB F	WB F	Effective Temperature
103	79	87

Adiabatic coolers were installed and the following results were obtained:

DB F	WB F	Effective Temperature
93	76	81 at 200 fpm

Case 3. The effect of the insulation is illustrated by values obtained on insulated and non-insulated molds:

	DB F	WB F	Effective Temperature
Non-insulated molds	115	82	90 at 300 fpm
Insulated molds	102	77	84 at 300 fpm

Case 4. The effect of increasing fan capacity is illustrated by our experience with a dye house, where, with a ventilation rate of 23,500 cfm and air velocities of 200 fpm, it was found that under the average worst conditions the working exposure was:

DB F	WB F	Effective Temperature
100	83	87

These results indicated that, if the ventilation rate was increased to 60,000 cfm, the effective temperature would be 80F. Fans having a total capacity of 54,000 cfm were installed in place of the former fans, which were inefficient as well as ineffective, and the working exposure was found to be:

DB F	WB F	Effective Temperature
93	76	81

In our opinion, excessive heat exposure presents problems of comfort, health and production. There are practical methods of control which can be satisfactorily employed. However, if the ventilation is not well designed it will produce little benefit. The desirable control obtained by the use of outside air for cooling indicates one advantage of locating plants involving hot processes, such as textile dyeing, lamp and tube manufacture, rubber and plastics molding, in areas which have moderate summer temperatures.

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Spot Cooling for Areas Near Hot Surfaces

The problem of excessive heat in summer is particularly acute in some factories where welding machines are used. Men must sit for long periods close to machines whose temperatures are as high as 550F. The surfaces of these machines radiate a tremendous amount of heat under conditions which are frequently detrimental to insulation.

Attempts to meet situations of this kind by blowing a large volume of outdoor air at the machine or operator may fail, due to the effects of drafts on the sweltering operator; furthermore, irrespective of the volume of air introduced, the radiation still remains. Where such local methods are used, better results may be obtained by overhead circular air diffusers rather than by grilles; further, diffusers should be selected so as to have more of small diameter rather than a few of large diameter.

Perhaps the best remedy for problems of this kind is spot cooling by the introduction of flexible air hose drops at each machine. These drops can introduce a small quantity of outdoor or slightly cooled or compressed air at high velocity. Drops can be extended to the floor and from there be run to any point when and as desired by the operator who, by operating a valve, can satisfy his individual requirements and also direct the air to any part of his body for as long as desired. This is more desirable than the usual method of fixed outlets.

Such a system can be supplemented by overhead exhaust ducts, though it should be remembered that a cubic foot of air exhausted is never as effective as the same quantity of air when supplied. Exhaust is less directional than supply; an exhaust outlet takes air in radial lines from all directions. Again, in many cases, one will find an exhaust system working to no advantage, simply short circuiting the air from supply to exhaust in an overhead area beyond the occupied zone. Such short circuits may be from mechanical supply inlets, inward from ventilating skylights, upper windows, or gravity roof ventilators directly to mechanical exhaust outlets near the ceiling. Some air may even short circuit from mechanical roof ventilators when these are not runing and are not provided with light check dampers which automatically close against reverse flow of air.

—T. W. Reynolds.

Trailer Refrigeration

JUST as ice was replaced in other fields by mechanical means, so is ice being replaced in trailers by trailer refrigeration. One development is the Trail-Aire Conditioner.

The unit, installed in Fruehauf refrigerator vans, will deliver pre-cooled products at the same temperature as when loaded into the unit or at temperatures which can be lowered several degrees in transit.

The device is a real year-round air conditioner that will either heat or cool the trailer interior, as needed. This is accomplished by reversing the cycle.

When the conditioner is being used to cool the trailer interior, it functions like any conventional refrigerating machine; the refrigerant absorbs heat in the evaporator at a relatively low temperature, thereby cooling or removing heat from the air in the trailer. Heat is removed from the interior by the flow of air through the evaporator coil. The refrigerant vapor is drawn from the evaporator coils through the condensing coil. While it is being circulated through this condensing coil, cool air is blown over the coil thus removing heat from the refrigerant vapor which returns it to a liquid form. Air circulation is 1,800 cfm.

When the conditioner is being used to heat the trailer interior, the previous process is reversed. By closing 3 white painted hand valves and opening 3 red painted hand valves the cycle is reversed so that the evaporator functions as a condenser and the condenser becomes an evaporator. To increase the efficiency of the heating cycle, waste heated air from the gasoline engine is utilized as a convenient source of heat so that regardless of the outside temperature, the unit is an efficient heater. Operation is fully automatic, being thermostatically controlled on both the heating and cooling cycles.

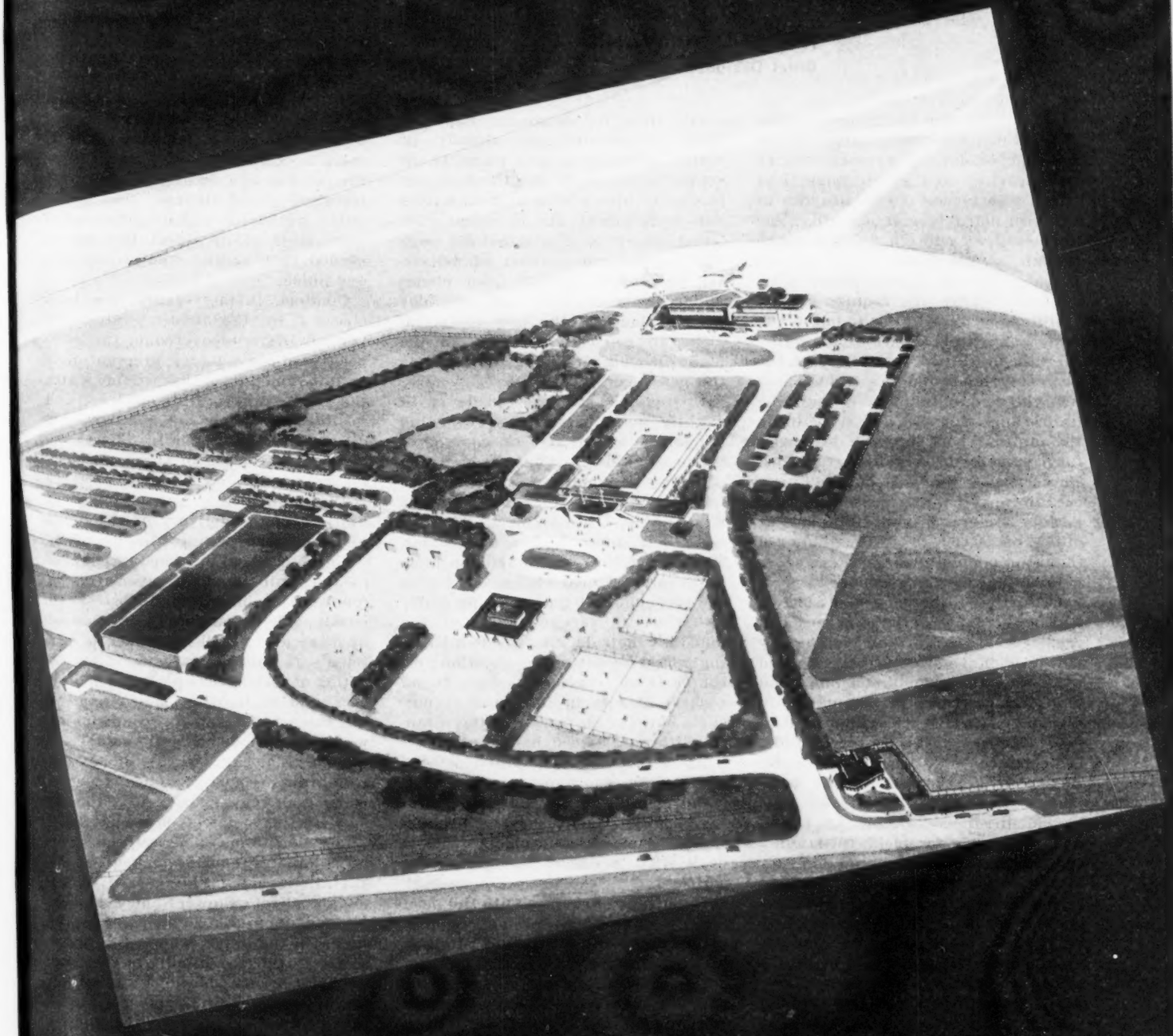
The Trail-Aire Conditioner is built as one package for removable installation in the nose or front end of the insulated van. This feature allows the unit to be completely assembled and tested in the plant, eliminating any field hook-up or testing, and makes it possible for the operator to remove a unit for major servicing or for replacement.

Unit is installed in protected place accessible through service doors in front wall of trailer.

The conditioner is powered by a 4-cylinder, V-type, air-cooled engine, equipped with automatic choke, battery ignition, 6-volt starter and generator and the necessary relays for full automatic stopping and starting. It is equipped with a high pressure cut-out switch which stops the engine if for some unnatural reason the refrigerant pressure goes beyond normal. It thus insures against blown head gaskets, and the resulting loss of refrigerant. This safety device also protects the compressor from overload.

The conditioner, engineered and built by Advance Manufacturing, Inc., is marketed by Fruehauf.

Heating, Ventilating, and Air Conditioning Problems in AIRPORT DESIGN



Prepared by the Staff of ALBERT KAHN ASSOCIATED ARCHITECTS AND ENGINEERS, INC.

Heating, Ventilating, and Air Conditioning Problems in AIRPORT DESIGN

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GENERAL DESIGN PROBLEMS

ROLAND A. WANK
Chief Designer

AFTER the war, the industry of air transportation will undoubtedly continue to develop existing specialized services and create some new ones. Short haul by helicopter or autogiro many become a reality, and plane-loads of spinach flying through the air at 400 miles per hour will probably appear commonplace. Each type of service will require ground facilities peculiar to itself; but of the vast aggregate of port construction over the next two decades or so the biggest volume and the widest field for the engineering and building professions will probably remain in the familiar port intended primarily for commercial passenger transport. Furthermore, for each outsize transoceanic terminal there probably will be ten or more through-stop ports at cities of 50,000 to a few hundred thousand population.

Not that such secondary ports necessarily will be modest in size; in fact, only expert crystal-gazers can predict what size port the average city will need, since size is so closely tied up with traffic density on one hand and characteristics of the planes on the other. On density, wild-eyed daydreamers of yesteryear look like crotchety conservatives in retrospect; the only rule that seems safe is to make the biggest guess you can, double it, then swallow hard and double it again for luck. On landing characteristics of planes, the tendency of the recent past has been toward longer, broader and more runways of heavier construction; this trend may be reversed, or at least not continue in proportion to growing volume, by planes that are less affected by cross-wind, have slower landing speeds relative to flying speed, perhaps shorter wings or none at all, being lifted and sustained by jets or rockets.

But for the heating and ventilating engineer the airfield itself will remain a matter of only passing interest, at least until the arrival of some new developments, such as underground steam lines for defrosting runways. More immediate, and already installed at some modern ports, is the servicing of plane positions at the passenger apron with heat in winter and conditioned air in summer—a trend which will undoubtedly continue unless the manner of delivering passengers to and from planes undergoes a radical (and possible) change, such as the use of special buses to get the passenger to the plane instead of taxiing the plane to the passenger.

Predictions can be made with slightly more assurance regarding hangars—which are, of course, of minor significance on through-stop airfields, although of great importance at terminals. Like runways, hangars have become bigger and bigger, their doors higher and wider. This trend will no doubt continue, until some radical change occurs in the preponderant type of flying craft; either such oversize "ships of the air" that their docking inside a building would be out of the question; or, contrariwise, craft that depends on rockets or jets in the place of outspread lifting surfaces. In the meantime, the heating of hangars will remain a very special problem compounded of enormous airspace, frequent opening of doors amounting to entire walls, and relatively low and spotty occupancy—a problem which is dealt with in one of the subsequent articles.

The airport structure with the most nearly established set of requirements is the administration building, which has many diverse functions, of which administration is only one, and from the point of view of space perhaps the least significant. Even in this building, the amount and type of passenger facilities may undergo sharp changes if the use of downtown passenger stations (best developed, so far, in New York City) became a general trend. It has been remarked in connection with La Guardia airfield that the imperial magnificence of the ticket offices and similar facilities is lost on the majority of the patronage, since passengers' limousines pull up directly at the plane gates—as they should. But for the type of port with which we deal here, two basic characteristics may be accepted safely for some time to come as guideposts of design. First, the comfort and dignity of air travel, featured by the airlines; second, the public ownership and management of such ports. Both affect the spaces needed, their arrangement, equipment and finish.

Comfort, in fact luxury, has been stressed by the industry since its younger days to overcome the competitive disadvantages inherent in a certain amount of hazard of which the public was quite conscious, and in the dependence on weather conditions which partially offset the primary attraction of speed. Respect for the patron's comfort and pleasure is the "leit-motif" in all contacts with him; from the delivery of tickets to his home and paging him by phone with information on schedule changes to the smile of that superlative of femininity—the airplane hostess. It is self-evident that port facilities used by passengers will continue to contribute to this policy as soon as the lifting of restrictions permit. The best of glareless lighting, noise control, air purification and air conditioning will be teamed up with soft color schemes, elegant furnishings and restaurants serving choice food to make each passenger feel as though he were the recipient of special solicitude. Washrooms and restrooms—always important in the makeup of the administration building—are likely to expand into showers and baths for patrons stopping for change of planes or on round trips where the speed of air travel may eliminate the need for hotel accommodations; into baby care rooms for the convenience of family travel (is there anything more desperate than the plight of a mother whose offspring needs dry wrappings while at a port or station?); and perhaps into bedrooms or retiring rooms for short stopovers. Concessions catering to the traveler will become more profitable with increas-

Occupants of administration building need wide visibili.y. Hence large glass area enters heating calculation.

ing traffic density; in turn airline patrons may depend on port facilities more heavily for their purchases. Needless to say that, catering to a select clientele, concessionaires will need and demand the latest and best in atmospheric control.

Now let us consider the administration building as a public project. Public ownership of passenger ports has become a tradition perhaps chiefly on account of the inability of the budding industry to shoulder the necessary capital investment, and the land acquisition which is practically beyond the capacity of private sponsors; but it is likely to remain a permanent policy for more cogent reasons. Air traffic is the freest, most fluid mode of transportation, and in the national interest it should remain so. It is not limited by topographically feasible routes of access, nor by the ownership of rights-of-way, as in the case of railroads; and unlike buses which serve way stations as well as terminal points, airlines from the other end of the earth may demand admission to any particular port on short notice. Thus public operation, endowed with impartiality and flexibility may be predicted as a permanent pattern and, in turn, will set up its own requirements for the type, quality and appointments of administration buildings.

To begin with, public buildings of whatever primary purpose, are traditionally also vehicles for the community to express its pride in itself. This may lead occasionally to extravagance, but at least implies good and substantial construction, which is just as well. Because, and also traditionally, it is much easier to obtain public approval of expenditures for construction of a project that arouses the popular imagination than to get the more humdrum appropriations for continued maintenance. Yet, while privately owned structures may be allowed to deteriorate if that serves the inclinations or pocketbook of the owner (and most of our railroad stations can illustrate to what lengths deterioration may be permitted to go), publicly owned structures should always reflect the self-respect of the community.

Then again, public structures should be, and normally are, accessible to the taxpayer, his wife, children, friends and out-of-town visitors. This is especially true of airports, the drama of which will probably continue to hold the interest of the public for a long time. Also, during the next decades our public agencies will no doubt bestir themselves to remove the astonishing lack of outdoors recreation facilities, so typical of most medium-sized cities; and airports as well as their immediate vicinities possess some inherent advantages in that connection. They are usually a healthy distance away from air pollution, on high and dry land, well served by access roads and utilities. The leftovers of the land originally purchased, even wedges between instrument landing clearances when not occupied by hangars, etc., are often ample for quite extensive recreation.

Thus, recreational facilities often adjoin the port, and in the nature of such things the combined attraction of the airport and the park vastly exceeds the simple sum of the drawing powers that each would exert alone. Most trips to the vicinity lead to the administration building at some stage, if not for observing the field and its traffic, then perhaps for the restaurant or other concessions. The airlines heartily approve the encouragement of this tendency on account of its great promotional value. Thus the spaces allotted to sightseers' and general public use make up a large portion of the administration building.

Another portion of the space is devoted to the activities of public agencies: The Civil Aeronautics Board which clears flights and directs air traffic beyond the immediate control area of the field; the field control, which will probably be operated in the future by the CAB too and which requires a control tower and an office at a point of vantage for the chief control officer; the Weather Bureau with a suite of offices overlooking at least the compass point where weather originates, facilities for filling, releasing and observing pilot balloons, contact with weather instruments placed on the ground or on the roof, and with the CAB suite; and offices of the airport administration proper, accessible but not too inviting to the public. At major ports there is often a post office, with good accessibility to planes and trucks.

Other functional requirements include spaces for handling baggage and express—even cargo until the volume of air freight will warrant separate facilities; offices of airlines with their multiplicity of tele-types, weather printers, radio and other communications equipment; some parts storage and repair; quarters for staff from porters to flight personnel, the rooms of the latter often developed into complete and comfortable clubs; extensive spaces for mechanical and communications equipment of greater than usual variety.

From the point of view of the heating and ventilating engineer or contractor there is nothing in the above features that isn't likely to occur in almost any modern building; but some combinations of circumstances are peculiar to airports.

For one thing, visibility of surroundings, while highly prized in most modern structures rates a special premium around administration buildings of airports. For some of the spaces mentioned above, sweeping view is essential, for others at least highly desirable. Thus almost all exterior walls of the building are likely to dissolve into thin glass, with even the protective roof projections typical of modern design barred because they obscure the sky view. Even if the use of thermopane or other insulating glass became quite general in the post-war world, the residual problems of heating, cooling and condensation control would still remain extraordinary in magnitude.

Then again, need for outside view on the part of some spaces and for direct field or road access on the part of others make the perimeter of the building so valuable, that the use of staggered levels is often necessary to increase the number of linear feet having direct exterior exposure. Therefore, all spaces not in need of a place along the exterior wall such as kitchens, washrooms, locker rooms, certain offices, baggage, storage and mechanical spaces are quite likely to wind up in the middle of the building

altogether dependent upon artificial ventilation as well as lighting.

Finally, this discussion could hardly be written by an architect without at least some passing notice of appearance, or call it "style" if you will.

Designers of the first airport structures of the U.S.A. could hardly possess a very clear picture of all the functions which the buildings later had to accommodate. With few facts to guide them, it was perhaps natural to fall back on the one known fact: That designs were for publicly owned buildings. It seemed to follow that those should be monumental in the accepted sense, symmetrical and at least neo-classic.

It may be hoped that the horse-whip-socket-on-the-dashboard period will have passed with the war. Purely from the point of view of appearance, the contemporary control cabins, radio masts, beacons, large glass walls of offices and waiting rooms seem as ill at ease in the framework of period wall masses as the pilasters and entablatures feel embarrassed in the presence of such brazenly functional elements; and the planes at the apron make most administration buildings look curiously archaic, as if they had been built by a generation which did not possess the plane-builders' knowledge of applied physics.

But what is more important, the many diverse yet interrelated functions of administration buildings just cannot be accommodated within a periodesque structure without grave sacrifice of efficiency. A mere enumeration of the lines of traffic should convince anyone that extreme ingenuity and complete freedom are required to produce acceptable solutions. Passengers, escorts, restaurant patrons, sightseers, baggage, express, mail, freight, flight personnel, mechanics, baggage handlers, office, building and concession employees, limousines, taxis, private cars, plane service vehicles, public carriers, etc., etc., all have to be kept out of each other's way and yet all should enjoy the most direct routes. Then, all modern ports should, profiting by the experience of the past, provide for maximum extensibility—of one particular function, or two or three, or all functions in balance. Buildings constrained by tradition are always ill adapted to that purpose.

So it might not be too much to hope for future airport structures as free and fresh as the traffic they serve, with glass walls overlooking the world of which they are the gateway, and above all, with space for heating and ventilating ducts properly allocated within the new freedom of modern design, to prevent premature baldness on the part of practitioners of the important art of atmosphere control.

HEATING FACILITIES

G. S. WHITTAKER
Mechanical Engineer Specializing in Heating

THE heating of an airport has both normal and unusual angles to be considered before deciding just what type of system should be used for the project as a whole and also for each type of building. The two main buildings in an airport of average size are the hangar and the administration building which require two entirely different types of heating systems — with the administration building system being of the more conventional type and the hangar system being somewhat of a problem due to the large doors and the unusual height of the building.

The location of the hangar in relation to the administration building will have a direct bearing on the type of heating used also on whether a central heating system will be used or separate heating plants installed in each building. If the buildings are reasonably close together, a central system or boiler house would be used whereas if the buildings are widely separated undoubtedly a separate heating system would be installed in each building. This is true particularly if automatic fuel such as oil or gas is available. However, in case the buildings are quite a distance apart a steam boiler could be used for the administration building, as described later, with direct fired heaters being used in the hangar. This system is being widely used in all parts of the country and has proved quite economical to operate. Another method finding favor with engineers in different parts of the country for the hangar building is a radiant heating system with the piping buried in the floor. This system while comparatively new has proved satisfactory as far as it has been tested, and will undoubtedly be used to a considerable extent in the future. These systems will be described in greater detail later in this article.

The Administration Building

As discussed in previous paragraphs, the administration building would unquestionably be ventilated and air conditioned in all the important areas; a fact which will have some bearing on what kind of a heating system should be selected for this building. Whenever air is supplied to all the building as in this case, the main functions of the radiation are to take care of the heat loss through the walls, windows and roof as the air change is already very well taken care of by the ventilating system. In order not to overheat the building with these conditions, a good system of control is required on both the blast coils and the radiation system whether it be steam or hot water. After careful consideration of various buildings of this character, a system would be selected utilizing low pressure steam to the blast coils in the ventilating systems and hot water convertors for supplying forced hot water to the direct radiation. Also, steam at 30 lb pressure would be piped to the kitchen equipment. This system gives excellent results in the way of control and is very reasonable to operate. The room temperature is maintained at a uniform level by supplying the air at a fairly constant temperature of say 72F and by varying the temperature of the hot water supplying the radiators in inverse relation to the outside temperature. The water temperature is controlled by an inside and an outside bulb with a constant differential which controls either a three-way valve on the water supply main or a modulating steam valve on the steam line to the convertor. This type of control is sensitive to both temperature and wind velocity and does a very excellent job of maintaining an even temperature in the building.

The radiation in this building should be either of the built-in type or wall hung convector with all the radiator connections concealed in chases in the walls. This method of piping has a very neat and clean appearance from all angles and can be accomplished much easier with a hot water system as contemplated rather than a steam system. Also radiation of this type is very sensitive to temperature change and lends itself very well to automatic control. The mains with this system can both be placed above the top floor in the attic space which allows all the air to vent back to the main air eliminators. Small key operated air vents are not necessary on each radiator.

The control tower or operations tower is located in this building and is essentially the very heart of an airport as all the planes both incoming and outgoing are controlled from this point. With these facts in mind it can be seen that the view from this room, which is located on the roof must be absolutely clear and unobstructed from all sides in order to allow the control operator an absolutely clear vision of all the field. The windows must be kept clear of fog in all kinds of weather winter and summer, and this can be accomplished by a combination of an air and radiator system in the winter. Warm air is blown across the windows from a narrow slot in the sill at a fairly constant temperature and high velocity which keeps the con-

densation from forming on the glass. Whatever extra heat is required over and above that supplied by the forced air is provided by concealed radiators set in the side walls and thermostatically controlled. This system has proven very satisfactory and is simple to install and keep operating at high efficiency in all kinds of weather.

The Hangar

As mentioned previously, there are at least three excellent methods of heating a hangar building even though its height and the large doors make it a rather difficult problem. These methods are:

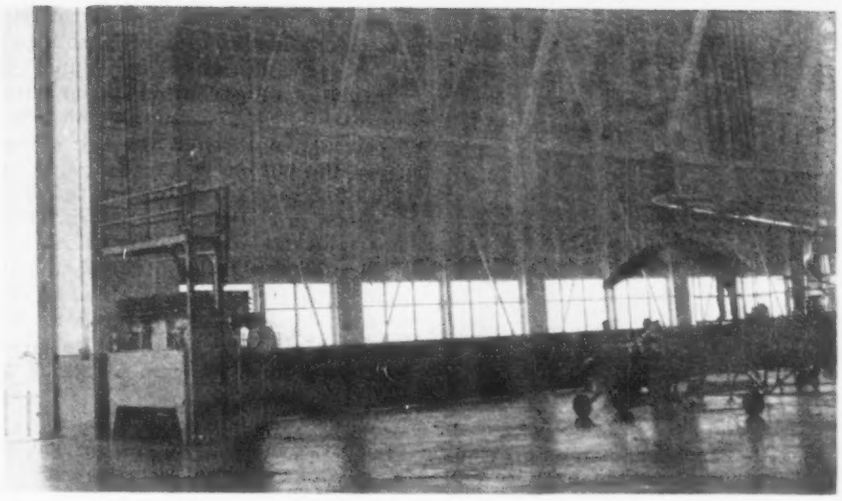
(a) Unit heaters operated from a steam boiler;
(b) Direct fired units with either gas or oil fuel;
(c) Radiant heating in the floor slab with hot water as the heating medium.

Unit Heater System. If the hangar and administration buildings were close together and steam generated for the latter building, a steam system with unit heaters probably would be used as the boiler would only have to be made somewhat larger to handle both buildings with consequently less supervision and manpower used.

The hangar usually is divided into two areas, namely the main hangar section and the shop areas. The hangar area is a rather difficult problem, but the shop areas are comparatively simple to heat as they are usually of only average height and can be heated with any good type of unit heater system. The hangar area however is a much more difficult problem as it is usually very high and has very large doors which open practically the whole end of the average hangar. This combination poses a rather difficult problem for the heating engineer.

One very good method of heating this hangar section which has been used on some very large hangars is as follows: Large floor mounted type blower unit heaters are placed on each side of the doors and if multiple doors are used a heater is placed between the doors as well as at the sides. These heaters are supplied with steam from the overhead high pressure steam lines and the returns are "blown up" to the return main which is alongside the steam line. To supplement these floor type heaters a row of overhead down-blow heaters is placed in the trusses over the doors which provide an air curtain approximately fifteen feet inside the doors.

All these heaters are controlled by starters which operate through thermostats and door switches. Whenever the door starts to open, switches turn on the heaters immediately to provide a hot air curtain from above straight down and straight across from the side as long as the doors are open.



Large, floor-mounted unit heater under automatic control blows across open hangar door to compensate for large heat losses. See also picture on next page.

When the doors are closed, the door switches assume the off position, but the heaters do not turn off unless the thermostats in this area are satisfied and the area is up to temperature.

The remainder of the hangar area is heated by overhead unit heaters with a rather high velocity discharge which does a very effective job of heating this section. The heaters are controlled by automatic starters and thermostats. The starters are of the three-position type which enables them to be run in the summer by by-passing the thermostat. All in all this system provides a very effective method of maintaining a comfortable working temperature in all parts of the hangar and makes for a very quick heating recovery when the large doors have been opened.

The unit heaters would be located overhead in the body of the hangar and in the shops with a vertical or projection type of heater used in these areas. The large doors would be treated as a separate unit with large down blow heaters placed directly above the openings and a large floor type blower unit heater placed at each side of the door. These door heaters would be thermostatically controlled the same as the other heaters but would also have a door switch in addition which would immediately turn on the heater whenever the large door is opened.

This system has worked out very well in a number of installations and is fairly economical to operate.

Direct Fired Units. Whenever a hangar is in an isolated position or is situated a considerable distance from any source of steam it is often more economical to use a direct fired system with large floor type units complete with either gas or oil burners completely self-contained.

These units are made in various sizes from 700,000 Btu up to 2,000,000 Btu and they can be selected of the size to suit the particular job at hand. Each unit is complete with fans, motor, exhaust fan on the stack, combustion chamber, burners, controls, etc., and has a very high degree of efficiency.

If oil is the fuel to be used a small oil pump is located in a favorable position to a large outside storage tank and an oil loop is run from this pump around the building and back to the tank. From this line a connection is made to each unit and as a constant pressure is maintained in the circulating line each burner operates at its maximum efficiency.

Another method of utilizing the direct fired type of heater is to use much larger units, say 7,500,000 Btu, placed at the rear of the hangar or in a basement. The air is returned through large underground ducts from a series of floor grilles which run along the full length of the large doors to the intake chambers of the heaters where it is heated and returned to the hangar area through fresh air grilles placed along the rear area or wall.

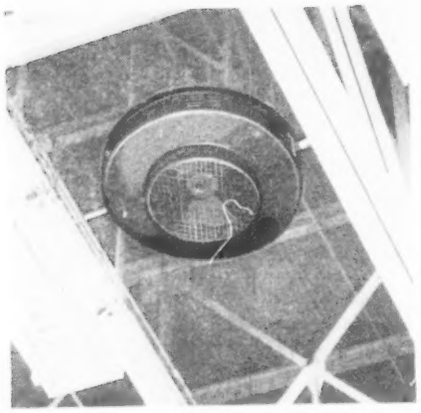
The shop section is heated in a conventional manner with overhead ducts and adjustable outlets.

This system has the advantage of fewer burners to look after and it does not utilize any of the hangar floor space which is at a premium.

A great many isolated hangars have equipped with this type of system all over the country and in Canada and have proved extremely satisfactory from all angles, both in heating when the doors are closed and for recovering the temperature after the large doors have been opened for a period of time.

Radiant Heating. The radiant heating type of system has been widely used in Europe for some time, and now is gaining recognition in the United States. There are a few hangar buildings heated by radiant heat in this country, and the system is said to do a very efficient job of heating.

The cost of the radiant heating installation with the piping usually placed in the concrete floor is comparable to any other system, and it has the advantage of a heat source at low level within the working zone.



Floor-type heaters shown on previous page are supplemented by a row of overhead down-blow units placed in trusses over hangar doors as shown here. Combination provides curtain of warm air when doors are opened.

The proponents of this type of system claim that the difference in temperature between the floor and the trusses is approximately 3F which is remarkably low. Also, as the floor slab is usually quite thick, it has a great deal of residual heat and does not cool off to any large degree when the doors are open. Thus the recovery of temperature is quite rapid at the low level where it is most needed.

The piping is installed in large grids fed by a system of supply mains. The piping is usually laid as level as possible on a bed of crushed stone or a rough concrete slab and then is incorporated into a finish slab approximately 6 in. thick.

The medium used to heat these pipe grids is hot water circulated by pumps from a boiler located in the building. The water is circulated at a maximum temperature of 135F and a maximum floor temperature of 85F is permissible. The temperature of the water circulated is governed by an inside and outside thermostatic bulb in approximately the same manner as described for the administration building, or by a new type of thermostat which has been developed for this type of system.

One of the problems encountered in certain sections of the country is sleet which freezes the bottom of the door along the rail and makes it extremely difficult to open the doors even with mechanical door operators. This problem occurs, of course, only where sliding doors are used.

The problem was overcome by using $2\frac{1}{2}$ in. extra heavy steel pipe for rails which were welded in place in a heavy channel frame. From one end of these rails a return line was run up into the truss space of the hangar where it was connected to a circulating pump which was in turn connected to an instantaneous heater with steam and return connections. From this heater a line is run down to the other end of the hollow rails which completes the circuit. This system is filled with water to which is added the proper amount of salt to make a low-freezing brine solution. Whenever necessary the pump is started by a push button starter within reach of the floor and the hot brine is circulated through the rail which frees the bottom of the door and allows the mechanism to open the door without any difficulty. This system has been patented by this office.

Similarly, it is being advocated in some quarters that a system of the radiant heating type be used in the concrete runways to melt the snow and keep them clear in all kinds of weather.

While this may seem to be a very expensive method of getting rid of snow and ice it has been looked into rather extensively by one or two consulting engineers with some surprising results. (See "Snow Melting by Underground Pipes," by T. N. Adlam — HEATING AND VENTILATING, June, 1945—ED.)

It is claimed that for a large airport snow costs approximately $200,000 annually, which covers the cost of equipment and labor plus the loss in income from flights which have to be cancelled due to unsafe landing and take-off conditions. Engineers who have made studies of the cost of an underground snow melting system of this kind for a large airport figure that it could be bought for approximately $3,000,000. The interest on this figure plus operating and maintenance costs would be less than is being spent with the present method and such a system would have the added advantage of keeping flying schedules with a minimum of interruption.

This snow melting system if used would consist of large grid systems of say $1\frac{1}{4}$ in. pipe approximately 24 in. on centers and about 1000 ft long. To feed these grids with a heating medium a steam line would be run in underground conduit from the power house to a steam heated water convertor located in small underground rooms opposite each grid system. From these convertors hot water would be pumped through the grid system at sufficient temperature to maintain say 45 degrees at the surface of the runway which would melt the snow and maintain a warm stratum of air immediately above the runway. This layer of air would tend to evaporate some of the water, but the main part of the melted snow would have to run off in the form of water to the runway drainage, which immediately imposes another problem outside the heating field; that is what type of drainage would be required.

The drainage system would have to be one with a positive surface-drainage complete with catch basins, etc., to take care of surface water. This means that when and if a system of this type is used engineers in charge of the sanitary and heating layouts will have to work very closely together if a thoroughly workable job is to be attained.

Another problem which arises in various areas of this country where airports will be built is that of keeping the cabin warm when the plane is standing for any length of time in the cold weather. This is particularly true of airports with small hangars or whenever lengthy repairs have to be made on the field.

This problem has been overcome by two or three companies in the following manner. A small gasoline or oil fired unit heater has been designed which is fitted on a small four-wheeled truck or chassis which is wheeled out to the plane. Flexible connections are made between the cabin and the heater and the unit started. A circulating fan on the heater draws the air from the cabin of the plane and blows it across a heater coil where the temperature is raised before it is discharged into the cabin again. The heater coil has finned tubes through which the hot exhaust gases of the gasoline motor are driven. The heated fins in turn warm the circulated air before it is discharged into the cabin.

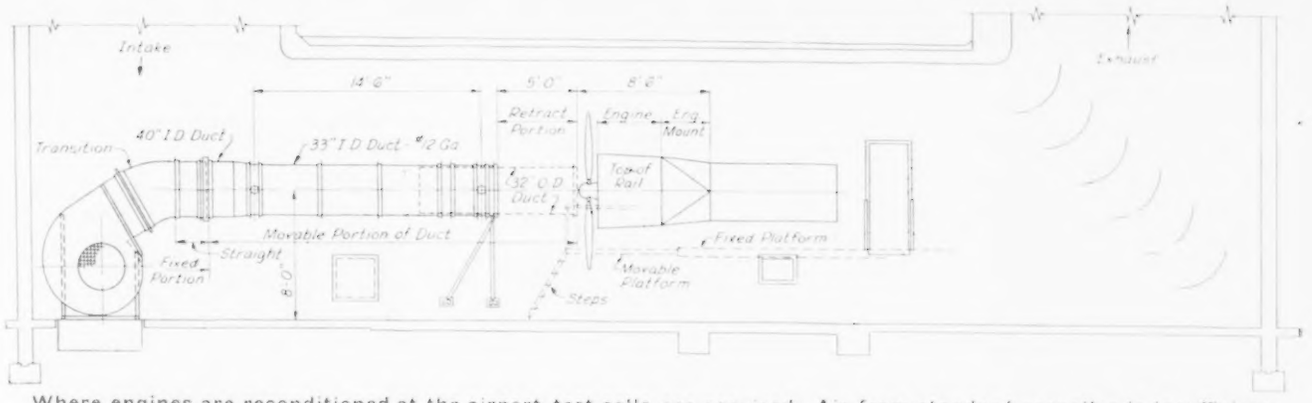
VENTILATION AND AIR CONDITIONING

H. E. ZIEL
Mechanical Engineer
Specializing in Ventilating and Air Conditioning

AIRPORT economy demands that both the traveler and the worker should have maximum comfort and healthful surroundings during their stay at the airport. Everybody talks about the weather, and airport designers do something about it. Yet few people agree on the exact limits of temperature, humidity and air movement necessary for the greatest comfort of man.

The history of weather conditions around the area of a proposed airport is of maximum importance both for flight knowledge and for the comfort of the traveler. In certain areas, a change in temperature either up or down from the prevailing or surrounding conditions is all that is necessary to give complete satisfaction. In other locations, especially where high humidities prevail, it may be necessary to remove large quantities of water vapor from the air. Thus the control of the temperature and humidity as well as the cleanliness of the air must be clearly understood and properly handled to provide maximum comfort.

The normal air conditioning system requires steam, electric power and water. The type of system to be in



Where engines are reconditioned at the airport, test cells are required. Air from standard propeller is insufficient for cooling during test. Supplementary air is directed through propeller by duct from auxiliary fan unit. Fan may be either inside (as shown) or outside test cell area.

stalled in any airport is dependent upon the availability of these three items. For instance, water may be readily available in certain areas and yet may be most critical in others. The refrigerating equipment used for dehumidifying the air requires a relatively large quantity of water. Should the water supply be limited, cooling towers may be used allowing for the repeated use of the same water.

The areas generally considered as essential or desirable for air conditioning are: control towers, radio and instrument rooms, dining rooms, waiting rooms, offices, etc.

Air conditioning equipment will usually include an efficient air filter assuring a dust and dirt free air supply to the distribution system. The arrangement of tempering coils, air washers, cooling and reheating coils may vary considerably in different areas, depending primarily on the limits and variations in outdoor conditions. Normally, in areas where zero temperatures are encountered for a considerable length of time and the vapor pressure of the outdoor air supplied to the building must be increased, the typical arrangement would be; air filters, tempering coils, air washer including the cooling coils, the fan unit and finally the heating coils. The heating coils are placed on the discharge side of the fan unit to allow for the control of the temperature in areas where the heat gain varies at different time intervals.

The above arrangement allows for the humidity control by either regulating the air temperature leaving the tempering coils or by heating the water in the air washer to the proper temperature above the dew point.

The cooling effect is usually obtained by mechanical refrigeration either of the direct expansion type or by means of chilled water, the water being cooled by highly efficient centrifugal machines. This latter type is usually used for loads in excess of 200 tons and where various air conditioning units are located in different parts of a building.

Artificial lighting should be given due consideration in the design of air conditioning systems. Due to lumen output of fluorescent lighting being higher per watt than incandescent lighting it is possible to obtain the desired lighting intensity by the application of fluorescent lighting with a resulting lower wattage or amount of heat generated. It should be borne in mind, however, that it is the total wattage of the fluorescent lamps and auxiliaries which should be included in the cooling system calculations.

The Control Tower should be completely air conditioned not only because of the great importance of this unit, but also because of the extreme conditions to which it is subjected. The sun effect on the roof and through the windows, along with some heat generating units in the equipment, cause temperatures in the control tower to approach uncomfortable limits.

There is also the problem of keeping the windows of the tower free from fogging due to formation of water vapor on the glass. This usually can be accomplished by providing a high rate of air movement, with relatively warm air, against the window surface. The air is supplied through jets located in the window sills and is allowed to discharge vertically upward, sweeping past the window glass. These jets are usually about one inch wide and extend the width of the windows. The total air supplied through the jets may not be sufficient to compensate for the total heat gain or heat loss. Supplementary air quantities can be introduced at some interior point. The exhausted air should be drawn from the room through outlets either in the floor or in the side walls near the floor.

Other problems in ventilating and air conditioning at an airport are:

(1) Conditioning of the plane cabin before take-off. This is usually accomplished by means of an air cooled recirculating unit which produces a comfortable condition in the cabin before take-off.

(2) Engine cooling for engine overhaul test. Many airports will recondition their engines at the field. When the engine is tested with a standard propeller, insufficient air passes over the engine and the crankcase oil reaches a prohibitively high temperature. This temperature can be reduced only by blowing air over the engine, or drawing air through a shroud around the engine.

The air required for cooling the engines during test is usually equivalent to 60,000 cfm. The fan unit supplying this volume of air operates against a static pressure of 25 in. of water. The motor driving the fan under these conditions is 300 hp in size. The air is discharged against the engines through the propeller. Two methods of fan installation are suggested. In one, the fan is installed in the test cell. The air is drawn through the acoustically treated air intake shaft, through which is also drawn the air for the propeller. The duct from the fan unit through which the air is discharged is equipped with a suitable nozzle which effectively discharges the air through the propeller.

The fan unit also may be installed outside of the test cell area. This method must be used for cells where space requirements or methods of engine handling do not allow for installation of the fan within the test cell. The air must be "jetted" through the propeller to cool the engine effectively, and keep oil temperatures down.

The fans used for engine cooling must be equipped with suitable volume control to prevent over cooling in cold weather. The volume control dampers are usually motor operated controlled by "open" and "closed" push buttons. The dampers move to the open position continuously when the "open" push button is held down and can be stopped in any position. The "closed" button moves the dampers in the opposite direction.

Engine testing often requires that air be supplied to the engine carburetor at some fixed temperature. Therefore, it is necessary at times to heat or cool the carburetor air supply to meet test conditions. Here again the cooling effect may be obtained from well water or by means of mechanical refrigeration.

PIPING OF FUEL

H. D. UNWIN
Mechanical Engineer Specializing in Piping

THE administration building and adjacent grounds are the most impressive to airport visitors. The facilities provided for patrons express the care with which the architect has planned for every convenience. The average air traveler gives little thought to those things he cannot see, and this is particularly true of the equipment required and the method employed to fuel the plane in which he is soon to be a passenger. However, this phase of airport design is of the utmost importance and becomes increasingly so as the size and number of planes using an airport grow. Like air conditioning, the proper method of providing fuel for airplanes requires a special study of the conditions to be met for each individual project.

It is possible and extremely probable that future airports will range in size from the private field at country estates to the field required for "global" planes which can make non-stop flights to any landing field in the world. Between these extremes will lie the suburban airport and airports for inland cities. The problem of providing available gasoline and the method of its movement from storage to plane tank has many ramifications.

The private landing field will require only small gasoline storage for one or possibly two grades of fuel which can be delivered to the airplane by the well-known service station type of pump. As the size of the airport is increased, up to 500,000 gallons storage will be required for large inland cities, while the "super" airport for ocean-flying boats or stratosphere liners may easily require the storage of three to five million gallons depending upon the availability of the supply and the means of delivering the gasoline to the airports. This would be particularly true where railroad facilities are not available and the fuel must be barged to the field. Another factor tending toward larger storage capacities is the study being made to heat runways to prevent the accumulation of ice and snow which will permit flying in weather not conducive to the shipment of fuel by rail or boat to the airport. Gasoline may be stored in either aboveground or belowground steel tanks, but the particular site and arrangement of the flying field, administration building, hangars and repair shops will influence to a large degree which method should be employed. Aboveground tanks require dykes to protect one from another and the surrounding area in case of fire or damage. Belowground tanks are safer installations and do not detract from the overall beauty of a well-planned airport.

In the matter of distributing the gasoline from the "tank farm" to the fuel tanks of the airplane, there are two accepted methods: (1) pumping, and (2) hydraulically. These systems have been discussed in detail in the January and February issues of HEATING AND VENTILATING. Briefly, the pumping system consists of positive displacement pumps or centrifugal pumps arranged to take suction from vented storage tanks and deliver the gasoline to mobile trucks or fueling stations located at convenient points. The hydraulic system consists of belowground storage tanks into which water is introduced at the bottom, and due to the displacement of the gasoline thereby the fuel is forced through the delivery mains to the fueling stations. Either system operates automatically and the choice of which method should be used can be decided only by the factors involved.

The fueling station consists of hose reels, strainers, and meters located in a steel box set flush in the concrete at points where planes are "docked" for receiving and discharging passengers. They are also provided near hangars for planes based at the airport. The advantage of fueling pits instead of mobile trucks for loading the planes' fuel tanks is apparent when we consider that many planes now carry upwards of 5,000 gallons, and large freight transports and long distance planes will probably carry a fuel load exceeding this amount. If a large number of such planes must be serviced, a single mobile truck load is inadequate even for one plane loading. Furthermore, with the greater use of helicopters, small private planes, jet propelled planes, etc., the number of grades of fuel will vary from a light oil to a gasoline exceeding a rating of 100 octane. The arrangement of embarkation points in the modern airport will probably provide for the allocation of definite locations for ocean flying ships, short-hop land planes, helicopters, etc. so that the fueling stations can be supplied with the proper fuel for the plane at each specific point.

In general, every known measure should be provided to protect the fuel storage and distribution system and thus safeguard the entire airport from any mishandling of the hazardous liquids used as fuels. Gasoline, like electricity, is dangerous only when handled by the inexperienced human element. Therefore, automatic controls when correctly installed will protect the huge investment from damage. The storage and distribution of airplane fuels is not new, but much can be done to improve the design and layout of such systems to gain the greatest benefits from the application of known equipment and methods.

TWA "Constellation" being refueled. Gasoline from storage tanks may be pumped into mobile trucks for delivery to planes. However, trend is toward fueling stations with hose reels, strainers, and meters in steel boxes set flush in the concrete at key points where the planes are docked.

Since infallibility is not yet universal, the wrong fuel could be delivered to an airplane fuel tank. In such cases, means must be installed to drain out the tanks. This is accomplished by providing "drainback" connections at fueling stations to which a hose is connected from the plane tank. The gasoline can then flow by gravity to a reclaim storage tank. When there are a large number of drainbacks, or when they are widely separated, the drain line may be connected to a pump to increase the rate of flow and to clear the line. This pump can then discharge the fuel to the proper storage tank if it passes an analysis test for purity or in case of severe contamination, it can be delivered to a tank reserved for lower grade fuel.

The fuel storage and handling system is really the forgotten part of the airport in so far as the air traveler is concerned, because he believes, and rightly so, that every precaution has been exercised to provide the plane, in which he is about to become a passenger, with the proper grade of fuel uncontaminated by any foreign matter which would result in engine failure during the flight. With the increasing types of engines and fuels required at the large airports of the postwar era greater effort must be exerted in engineering the fueling systems to maintain the high degree of confidence placed in this phase of airport design by the patrons of air travel.

SIZING STEAM HEATING MAINS

TABLE 1.—PIPE SIZING TABLE FOR STEAM MAINS.
(In terms of square feet of direct radiator surface served)

Pressure Drop, Ounces per 100 Ft.	Pipe Diameter, Inches															
	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16
	Square Feet Direct Steam Radiator Surface															
¼	14.0	28.4	62.8	92.2	195	326	596	892	1256	2324	3816	7952	14,480	23,248	29,416	41,388
½	19.2	40.4	88.8	138	275	460	840	1260	1776	3288	5396	11,240	20,468	32,864	41,576	58,784
¾	20.0	49.2	109	168	337	564	1028	1540	2176	4020	6600	13,752	25,044	40,204	50,868	71,916
1	28.0	56.8	126	194	390	652	1188	1780	2516	4648	7636	15,904	28,964	46,496	58,828	85,082
1½	34.4	69.6	154	238	476	800	1456	2180	3084	5700	9356	19,492	35,496	56,984	72,100	101,932
2	38.4	78.0	173	267	536	892	1632	2444	3452	6380	10,476	21,324	39,740	63,804	80,724	114,128
3	48.8	98.8	218	327	676	968	2060	3284	4360	8060	13,232	27,564	49,832	80,584	101,956	144,144
4	56.0	114	251	388	776	1300	2376	3552	5020	9280	15,240	31,748	57,816	92,820	117,436	166,032
5	62.8	127	141	436	872	1456	2660	3980	5628	10,400	17,080	34,776	64,744	104,008	131,592	186,044
6	68.8	139	308	476	952	1592	2912	4356	6156	11,380	18,688	38,924	70,880	113,996	143,976	203,556
7	74.4	151	333	516	1028	1724	3148	4712	6656	12,304	20,208	42,092	76,652	123,060	155,696	220,128
8	79.2	161	355	548	1100	1840	3360	5024	7100	13,128	21,556	44,904	81,768	131,276	166,092	234,824
9	84.4	171	378	580	1168	1952	3568	5340	7544	13,948	22,904	47,716	86,888	139,492	176,484	249,520
10	88.8	180	398	616	1228	2056	3756	7025	7944	14,684	24,112	50,224	91,460	146,832	185,776	262,652
12	97.2	197	436	672	1348	2252	4116	6156	8700	16,080	26,408	55,008	100,168	160,016	203,468	287,664
14	105	213	472	728	1456	2436	4448	6660	9408	17,392	28,560	59,492	112,336	173,928	210,056	311,116
16	112	226	500	772	1548	2588	4732	7080	10,004	18,492	30,368	63,260	115,196	184,940	233,988	330,816
18	119	242	536	824	1652	2764	5048	7556	10,676	19,736	32,408	67,504	122,924	317,348	249,688	353,016
20	126	255	564	872	1744	2912	5320	7964	11,262	20,800	34,156	71,152	129,568	208,012	263,180	372,088
25	140	285	628	972	1868	3256	5868	8900	12,576	34,156	38,176	79,524	144,812	232,484	294,144	415,864
30	153	310	688	1060	2124	3548	6484	19,704	13,712	25,347	41,620	86,700	157,876	253,460	320,684	453,388
40	178	352	796	1228	2460	4112	7512	11,244	15,888	29,368	48,224	100,452	182,920	293,664	370,748	525,304
60	218	440	966	1508	3016	5044	9212	13,788	19,480	36,008	55,132	123,172	224,292	360,088	455,588	644,120
80	251	508	1128	2175	3508	5828	10,644	15,928	22,504	11,604	68,316	142,304	259,136	416,024	526,360	744,180
100	281	568	1260	1944	3896	6512	11,896	17,800	25,152	46,496	76,352	159,048	289,620	464,968	588,284	831,728

Table 1 is a tabular solution of Babcock's formula for flow of steam through pipes with the flow expressed in square feet of radiator served. The data are suitable for sizing all dripped horizontal steam mains and branches, and down feed risers. They are not recommended for lines where the condensation flows opposite to the steam flow. The figures given in Table 1 are based on an initial pressure of 2 lb per sq in gage and a length of line of 100 ft. The length of pipe in any given case is the run in feet plus the equivalent length of valves and fittings given in Table 4.

For length of pipe other than 100 ft, or for initial steam pressures other than 2 lb gage, multiply the proper value in Table 1 by the factors in Tables 2 and 3, respectively.

USE OF TABLES

Example. A steam main runs from a low pressure heating boiler in a straight line to a riser 50 ft away and serving 600 sq ft of radiator; 25 feet further a second riser serves 1000 sq ft of radiator; 50 ft further a riser serves 800 sq ft. What size should the different sections of the main be if the allowable pressure drop is 1 oz for each section?

Solution. Since the boiler is of the low pressure heating type, a gage pressure of 2 lb applies and Table 1 will be suitable after length adjustment is made. The section from the boiler to the first riser carries steam for 600 + 1000 + 800 = 2400 sq ft and is 50 ft away. From Table 2, the multiplier for 50 ft is 1.41.

We must select the pipe in Table 1, opposite 1 oz, which gives a value which when multiplied by 1.41 is next above 2400. As a trial use 1780, for a 3½ inch pipe. 1780 × 1.41 = 2510. Consequently the first section should be 3½ inch pipe.

The second section, 25 ft long, serves 1000 + 800 = 1800 sq ft. From Table 2, the length multiplier is 2.0. In the 1 oz column of Table 1 find 652 (3 inch pipe). Now 652 × 2 = 1304 (too small) while 1780 × 2 = 3560, well over 1800, so that this section should be 3 inch pipe.

The final run of 50 ft, with a multiplier of 1.41 and a load of 800 sq ft, calls for a 2½ inch pipe, for 652 × 1.41 = 919, well over 800.

Example. A horizontal steam main connects a boiler and a riser connected to 2700 sq ft of radiator. The main contains a gate valve, two 90° standard ells and a 45° ell, and is 138 ft long. What size pipe is required if the allowable pressure drop is 1 oz per 100 ft and the pressure is 5 lb gage?

Solution. From Table 1 opposite 1 oz find 4648 as the nearest larger number to 2700, and calling for a 5 inch main. From Table 4 a 5 inch gate valve, open, has an equivalent length of 2.9 ft; two stand-

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TABLE 2.—MULTIPLIERS FOR ADJUSTING VALUES IN TABLE FOR LENGTHS OTHER THAN 100 FT.

Equivalent Length of Line, Feet	Multiply Values in Table 1 by
25	2.00
50	1.41
75	1.15
100	1.00
125	0.894
150	0.819
175	0.755
200	0.707
250	0.633
300	0.575
350	0.534
400	0.500
500	0.447
600	0.409
700	0.378
800	0.354
900	0.332
1000	0.316
1250	0.283
1500	0.258
2000	0.224
2500	0.200

For lengths other than given, find the reciprocal, extract the square root, and divide by 0.10. Result is the multiplier.

ard 90° ells, 5 inch, a length of 26 ft, and a 5 inch 45° ell, 6 ft. Totaling we have $3 + 26 + 6 = 35$ ft. Adding this to the 138 ft run gives 173 ft. This is very close to 175, and opposite that number in Table 2 find .755. From Table 3, for 5 lb, the multiplier is 1.07 and $1.07 \times .755 = .808$. Consequently, in the 1 oz column of Table 1 find a number which when multiplied by .808 is larger than 2700, or, if $x =$ this number, then $.808x = 2700$ or

$$x = \frac{2700}{.808} = 3350.$$

TABLE 3.—MULTIPLIERS FOR ADJUSTING VALUES FOR INITIAL STEAM PRESSURES OTHER THAN 2 LB. GAGE

Steam Pressure	Multiply Values in Table by
Inches of Mercury, Abs.	
5	0.407
10	0.564
15	0.682
20	0.780
25	0.866
Lb. per Sq. In., Gage	
0	0.945
0.5	0.958
1.0	0.970
1.5	0.995
2.0	1.00
2.5	1.01
5	1.07
10	1.21
15	1.31
20	1.41
25	1.50
30	1.59
40	1.74
50	1.89
60	2.02
75	2.20
100	2.48
125	2.72
150	2.94
200	3.33
250	3.68

For steam pressures other than given, find specific volume (cu. ft. per lb.) from steam tables. Reciprocal is density. Extract square root of density. Divide by 0.2049. Result is multiplier.

Refer again to Table 1, opposite 1 oz, and find that 3350 is smaller than 4648, so that the 5 inch pipe is satisfactory. In many cases the second check gives one pipe size difference so that the valve and fitting resistance must be recomputed.

TABLE 4.—EQUIVALENT RESISTANCES OF VALVES AND FITTINGS.

Valve or Fitting	Nominal Diameter of Pipe, Inches																		
	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
	Equivalent Length Straight Pipe, Feet																		
Globe valve	22	27	37	44	55	65	80	100	120	140	160	220	280	340	380	430	500	550	650
Angle valve	12	15	18	21	28	32	41	50	55	70	80	110	140	160	190	220	250	270	380
Swing check valve, open	5	7	9	11	14	15	9	22	25	32	40	50	65	75	90	105	120	130	150
Gate valve, open	0.5	0.6	0.8	0.9	1.2	1.4	1.6	2	2.2	2.9	3.5	4.5	5.5	6.5	8	9	10	12	14
Gate valve, ¼ closed	2.5	3.5	4.5	5.2	7	8	10	12	14	17	20	25	34	40	45	52	60	67	80
Gate valve, ½ closed	14	16	22	25	35	40	50	60	65	80	100	135	165	200	230	260	300	320	400
Gate valve, ¾ closed	55	70	90	110	140	160	200	240	275	325	400	525	700	800	950	1100	1300	1400	1520
Tee	4.5	5.5	7.5	9	12	14	16.5	19	21	27	34	44	55	65	75	88	110	115	135
Elbow, standard	2.0	2.6	3.5	4.5	5.3	6.3	8	9.5	11	13	16	20	25	31	36	40	45	50	60
Elbow, medium sweep	1.7	2.2	3	3.5	4.5	5.3	6.8	8	9	12	14	17	22	25	30	35	40	43	51
Elbow, long sweep	1.4	1.7	2.4	2.8	3.5	4.2	5.1	6	7	9	11	14	17	20	23	25	30	34	40
Elbow, square	4.5	5.5	7.5	9	12	14	16.5	19	21	27	34	44	55	65	75	88	110	115	135
45° elbow	1.0	1.3	1.6	2	2.5	3	3.7	4.4	5	6	7.3	10	13	15	17	19	21	23	29

Notes. Values for closed (180°) return bends, approximately between values for square elbow and check valve.
Values for entrance into pipe (as from tank) approximately between 45° ell and long sweep elbow.
Values for run through a tee, same as long sweep elbow.
Values for run outside outlet of tee, same as for tee.

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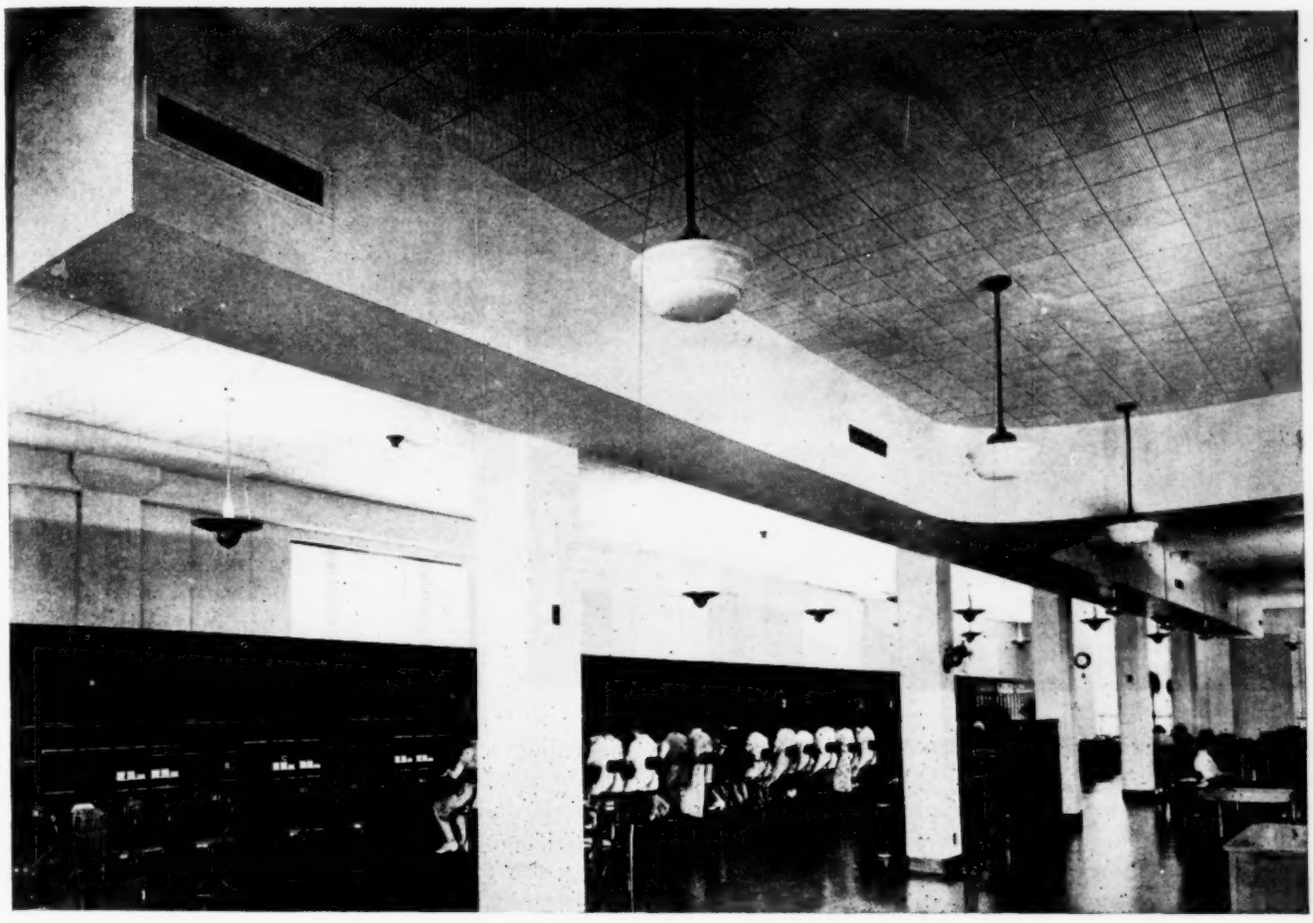


Exposed air conditioning ducts in a telephone building at Jackson, Miss. The mill-bonderized galvanized ducts were painted with white enamel immediately after the ducts were installed.

Paint Surface for Galvanized Sheets

WHEN paint is applied to zinc or galvanized coatings a reaction takes place between the paint oils and metallic zinc. This results in the paint film becoming brittle and losing adherence.

To overcome this, the Paintgrip process has been developed to insulate the paint from the protective galvanized coating on steel sheets. The sheets are immersed in a patented bonderizing solution at the steel mill. This results in a crystalline phosphate surface film that has much the same texture as extremely fine sandpaper. The phosphate film is chemically united with the zinc coating and prevents the paint from coming in direct contact with the zinc surface. No acid etching is required before painting.

Experience shows that these sheets have the same forming qualities as regular galvanized steel. However, the material is not recommended for severe forming and drawing operations.*

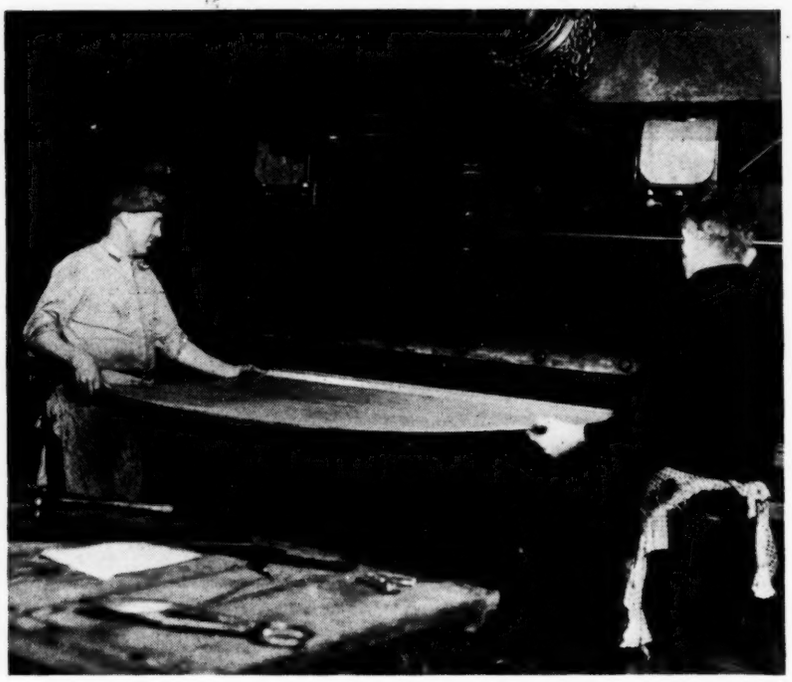
Minor scratches on a Paintgrip surface are not important because the film around a scratch will hold the paint over the scratched area. Because the paint-drying action of the zinc is limited to such a small area, it will not affect the insulating value of the surrounding film.

Where the scratched surface is large, complete film coverage can be assured at sharp bends, for example, by a special paintgripping solution which can be applied by brushing, wiping or spraying. Two minutes after this treatment the area is sponged with water and allowed to dry before painting.

Welding. Paintgrip sheets can be successfully welded by spot, metallic arc, carbon arc, or oxy-acetylene welding methods. If severe corrosive service is anticipated, or if a smoother, more attractive product is desired, welded joints can be coated by soldering, metal spraying, or a combination of coating powder and heating after welding.

Soldering. As with any other zinc-coated metal, the sheet must be fluxed properly if the best possible soldered joint is to be obtained. A mixture of equal

*Where equipment or sheet metal work necessitates deep drawing or severe forming, another special-purpose sheet steel, Zincgrip-Paintgrip, is indicated. This steel has a tightly adherent zinc coating that does not peel or flake and is bonderized at the mill to take and to hold paint.



One of the many operations required in the making of a metal cabinet. The bonderized coating adheres firmly during the forming.

parts of cut acid, raw acid, denatured alcohol and water has been used with highly satisfactory results.

Finishing. While practically any good paint system can be applied to these special galvanized sheets without pretreatment, the bonderized surface is not a cure-all for poor paint. Where the final finish is to be a lacquer, a good oil-base primer should be used as the ground coat. If a baked enamel finish is desired, the paint manufacturer will usually recommend a suitable primer if a primer is required. Although any suitable baking system can be used, the galvanized sheet will not withstand temperatures higher than 400 — 450F. Special paints are also available for surfaces subjected to sub-normal temperatures as in refrigeration work.

Storing. As with all galvanized sheets, this material should be stored in a clean, dry place to avoid absorption of water by the paintgripping film. If possible, the storage room should be heated in winter.

Cleaning. Shipping and manufacturing operations usually make it necessary to clean the sheets before paint is applied. Cleaners such as benzine, naphtha, and lacquer thinners are recommended for hand cleaning. Acid cleaners should not be used because they destroy part of the paintgripping surface.†. Sheets should be thoroughly dried before painting. It is important that a bonderized surface, like most other materials to be painted, should be clean to insure good paint adhesion and to avoid the formation of blisters during and after painting.

Information and illustrations for this article provided through the courtesy of The American Rolling Mill Company, Middletown, Ohio.

†Vapor degreasing is also recommended, and where production line spray equipment is available, emulsion cleaners are effective.

$21,000,000,000 Worth of Construction Work

Construction programs that have been announced by private enterprise and provided for by the Federal Government, which now total approximately $21,000,000,000, give an indication of the enormous amount of construction that will be needed after the war, H. E. Foreman, managing director of the Associated General Contractors of America, declared in discussing the outlook for the industry.

"Private construction programs that have been publicly announced total about $6,000,000,000 and the public programs about $15,000,000,000," he explained. "Most of these programs cover periods of from five to ten years."

Construction programs totaling about $750,000,000 have been announced by the automobile companies; $150,000,000 by chemical and paper companies, $300,000,000 by the theatrical industry and by colleges and universities, and about $260,000,000 by a miscellaneous group of productive industries. Utility companies have the largest program with a total of about $4,000,000,000 for modernization and expansion.

The largest single construction potential that has been announced is new residential construction which the National Housing Agency estimates at about 1,000,000 units a year in the first decade after the war.

For federal-aid in airport construction, the program now pending in Congress calls for the expenditure of $2,000,000,000 over a one-year period.

As further evidence of the need for construction, Mr. Foreman pointed out that statistics recently released by the Twentieth Century Fund on estimated capital outlays during the first 15 years after the war include about $135,000,000,000 worth of construction of various kinds.

"These statistics," he continued, "definitely indicate that under favorable conditions construction can be an important factor in the transition from war to a prosperous peacetime economy. But both completed plans and adequate materials must be available in order for the industry to resume operations rapidly and on a scale that will provide jobs and the business stimulus that will be needed."

Unit Heaters Solve Ventilation Problem

FRANCIS C. HOLBROOK
Mechanical Engineer, Department of Sanitation, City of New York

SERIOUS concentrations of carbon monoxide gas developed in the collection truck testing and repair floor of the Department of Sanitation motor vehicle repair shop during the heating season, and to a lesser extent during the non-heating season. This quantity varied from two to seven parts in ten thousand and was most heavily concentrated in areas frequented by the test and repair men.

The shop building, a ten story structure measuring approximately 170 ft x 300 ft, has facilities on the fifth floor for assembling about fifty-five trucks for preventive maintenance. An interior court measuring approximately 100 ft x 50 ft provides lighting and natural ventilation for all floors through a glass canopy with pivoted sash, at the roof level. Ventilation through this court was insufficient for the removal of vitiated air created at the fifth floor.

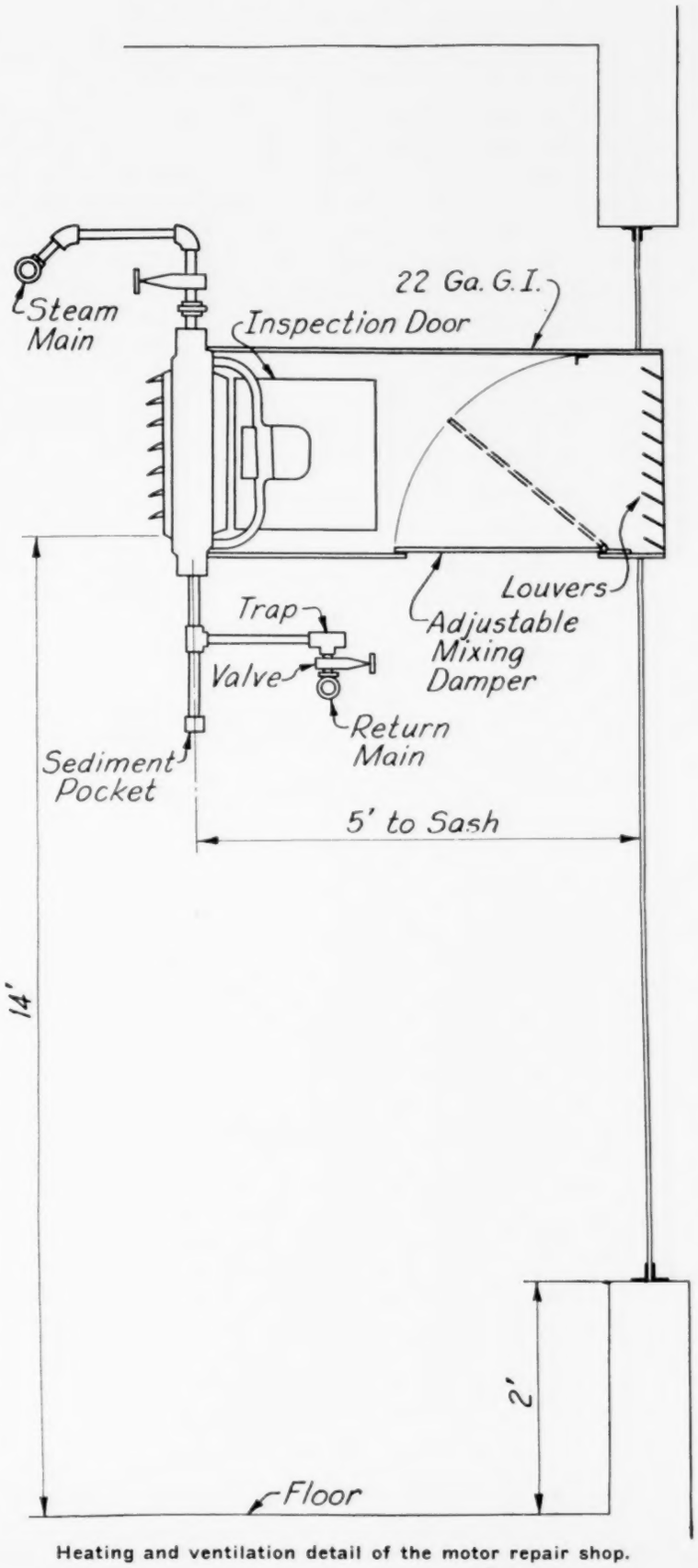
The usual practice of employing fresh air and exhaust fans, air heaters, control dampers and grilles was not feasible because of the limited space for the installation of such equipment, need for maximum head room for raising and lowering truck bodies, interference with natural lighting and cost.

Separate Control

To correct the condition and to meet the operating requirements, it was decided to install a number of unit heaters along the outer periphery of the maintenance floor. Thirty-four Dunham horizontal ceiling suspension type units were arranged about fourteen feet above the floor and connected to a short duct for the admission of fresh air to the unit, as shown in the sketch. A mixing damper was installed in this duct for the partial recirculation of air during periods of extremely cold weather and when few trucks were present for servicing. Each unit is controlled separately, thus permitting the operation of a predetermined number of units.

The total amount of air supplied is 180,000 cfm, which lowers the concentration to about two parts per ten thousand while the maximum number of trucks are being serviced.

Pivoted sash and other window openings permit the passage of gas-laden air into the interior court where the stack effect induces its discharge through opening in the glass canopy.



Heating and ventilation detail of the motor repair shop.

Piping and System Control for Radiant Heating Systems

R. G. VANDERWEIL
Project Engineer, Chase Brass & Copper Co., Waterbury, Conn.

1. *Pressure Drop.* The procedure of dimensioning the pipes for radiant heating systems is similar to the procedure used for conventional hot water forced circulation systems. Basically the two systems differ only in one point, that of pressure drop, which is greater in the sinuous coil than in the radiator. In small buildings, as in one family homes, where it is desired to use the conventional circulator, the maximum length of the coils has to be reduced to a degree where the total pressure drop in coil and piping is equal to the relatively small head of the circulator and in the average home, with ⅜ in. nominal ceiling coils, the maximum coil length is restricted to about 200 feet. With ½ in. nominal tubes in floor coils the total length should not exceed approximately 300 ft. Naturally this length changes with local conditions, such as distance between pump and coil, design temperature drop in coil, etc., and must be computed individually. In large buildings a proper balance should be drawn between small tube dimensions, accompanied by high pressure drop, large pump capacity and high power consumption, and large tubes, with corresponding low pressure drop, small pump capacity and low power consumption.

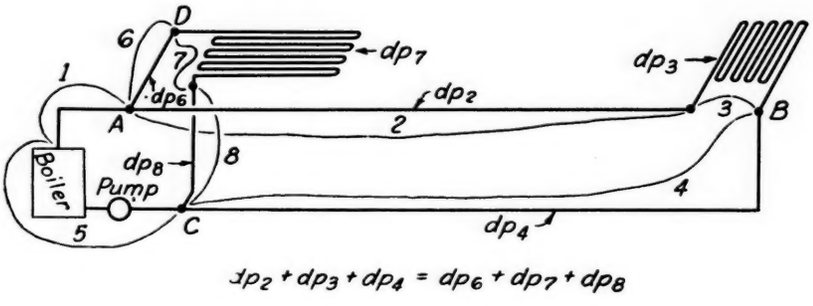


Fig. 1. Pressure drop balance in piping.

In systems where no individual plug cocks or orifices are located in all coil connections, and particularly in larger buildings, it is advisable to carefully balance by computation all hot water circuits and to start as usual by computing the dimensions of the longest circuit, that is, 1-2-3-4-5 of the example Fig. 1. After the dimensions for section 1 to 5 and their individual pressure drop dp_1 to dp_5 are known, the branch lines may be dimensioned. When computing the branch line 6-7-8 of the example, it should be considered that the total pressure drop available for this line must be equal to the total pressure drop of the line 2-3-4, and if the branch line proper (6 and 8) is sufficiently short, it will be found that an appreciable pressure drop is available for coil 7:

$$dp_7 = (dp_2 + dp_3 + dp_4) - (dp_6 + dp_8) \quad \text{(Eq. 1.)}$$

Under these circumstances the length of coil 5 may well be greatly in excess of 200 ft and still conform to the circulator's requirements.

2. *Temperature Drop in Coils.* One method of reducing the pressure drop is to increase the temperature drop of the water in the coils. Theoretically this drop could be as high as 50F and more, but practically it is restricted. The maximum water temperature for floor panels is set, and rather low, by the allowable maximum floor temperature. Also, for ceiling panels the water temperature is restricted if such panels are installed in rooms with low ceilings. With 8.5 ft ceiling height for instance, the panel surface temperature should not exceed 115 to 120F and the maximum water temperature must be selected accordingly.

The minimum or return water temperature also is restricted by the panel efficiency. For obvious reasons a tube conveying water of a mean temperature of 80F will result in small panel heat output. For practical purpose, and with the presently used panel structures, temperature drops of from 15 to 30F in the floor panels, and from 20 to 35F in the ceiling panels are used. In most cases, it is possible to assume the mean water temperature as mean of the maximum (coil inlet) and minimum water (coil outlet) temperature.

3. *General Piping Problems.* In small buildings it is customary to use the conventional boiler layout as shown in Fig. 2. In the flow control or by-pass valve, the return is mixed with hot water, generated in the boiler. This mixing valve is regulated by outdoor and indoor thermostat and if the boiler cir-

EDITOR'S NOTE: Previous articles in this series on radiant heating by Mr. Vanderweil appeared in the April, June, and July issues.

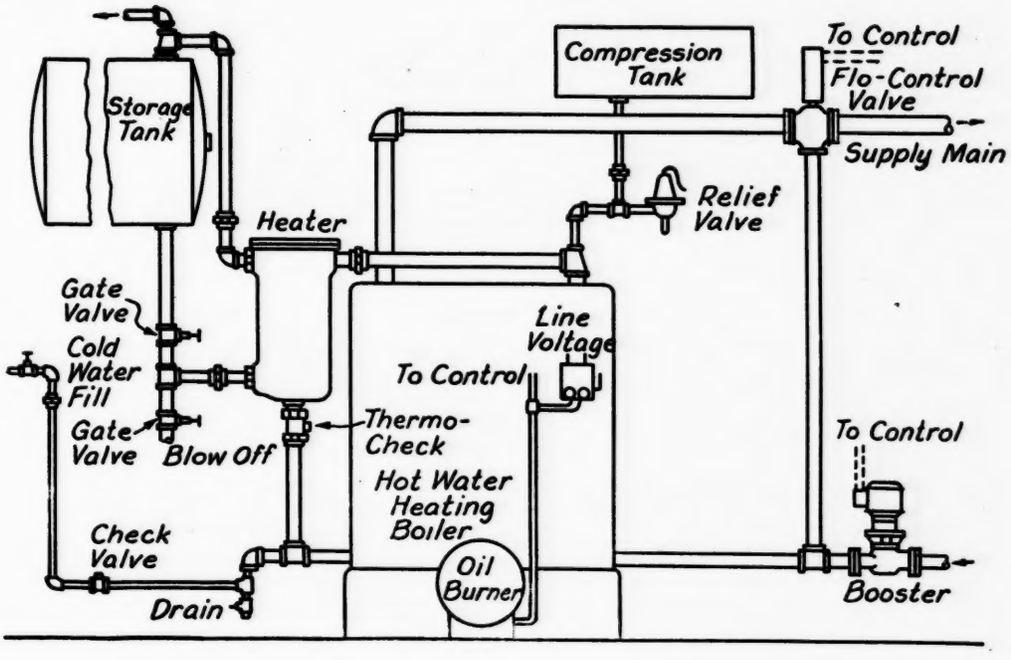


Fig. 2. Piping for a typical small boiler installation.

culation is fully stopped by this valve the pump is turned off. The boiler water temperature is kept at constant level, so as to provide for a constant temperature of the domestic hot water. A 100 lb per sq in air tested expansion tank is used in combination with a relief valve, to prevent excessive system pressures. Any conventional domestic water heater may be installed.

In large building projects it may prove of advantage to use steam as the heat transmitting medium. The boilers are located at a central boiler-plant and steam lines run to individual heat exchangers (convertors) located in the various buildings or wings. Each heat exchanger generates water of the temperature desired for this building or section and is provided with an individual circulating pump. The sections are grouped in such a manner that all rooms of same exposure are included in a separate zone.

With installations in high buildings, each heater may take care of a few floors only and in such cases, the horizontal grouping will give place to a vertical or combined vertical-horizontal zoning.

In smaller buildings, again, the rooms may be grouped according to exposure, and all panels of same exposure connected to a common distribution line, the circulating water of which is regulated by individual mixing valves.

In cases where panels of small heat capacity (lag or inertia) are used, such as ceiling panels in a 4 in. slab and with ¼ in. tube cover and 4½ in. tube spacing, the by-pass valve at the boiler or the convertor may be regulated by aquastat, keeping the hot water temperature constant. The pump is governed by room thermostat. However, in general and particularly with panels of great heat inertia, this system is not recommended and the water temperature should vary inversely with the outside temperature. With such panels the time lag between start of panel heating period and start of room heating period is great and *if* the hot water temperature is kept constant, and is relatively high on warmer days, the panel stores a great amount of heat before the room thermostat is affected, and supplies this heat to the room after the thermostat has cut the hot water supply, thereby causing an excessive rise of room temperature. For this reason, a regulation of the water temperature by outside bulb and inside bulb combined is preferable.

4. *Panel Connections and Balancing of System.* Quite frequently panel coils receive individual control valves but by no means is it necessary to install plug cocks or orifices in each system. Such cocks are not essential where the pressure drop in the individual branches of the hot water piping has been carefully computed (see Eq. 1). If this was not the case, plug cocks or orifices must be installed in each coil connection in order to enable the contractor to properly balance the circulation. Orifices or valves may preferably be located in closets at an elevation above finished floor of about 2 feet or more for floor panels and 6 feet or less for ceiling panels. Where valves cannot be located in closets, they may be installed in wall boxes at convenient height covered by flush wall plates. In order to provide for continuous slope of coil and connections, it is imperative to install the orifice or valves in the panel return line of floor panels and in the supply line of ceiling panels if the piping is laid out according to Fig. 4 of the previous installment of this series.

A number of radiant heating systems have been built in small houses, having individual supply lines to each panel, with control valves and regulating cocks near the boiler. It was found that such installations proved unduly costly and also that the valves were not actually used for regulation even in cases where thermometer readings proved that balancing of the system was required.

Where cocks are used to provide the proper circulation and it is found that one room is overheated, the plug is appropriately regulated in order to reduce the rate of flow through the coil and therewith the panel's mean surface temperature. This process does

Fig. 3. Radiant heating installation in a California residence.

not alter the water supply temperature of the regulated coil or any other coil.

Remarks About System Control

Automatic controls used so far in connection with most radiant heating systems are essentially like those used with conventional systems. However, a few control systems especially designed for radiant heating are presently available and it is to be expected that a number of schemes will be developed not only taking into consideration the radiant component of the room heat transfer, but also the heat capacity (inertia) of the panel.

In systems where the tubes are covered by heavy depths of concrete and the panel inertia is approximately equal to the heat inertia of the outside enclosures, the heating system could be regulated by the water temperature only, which would change proportionally to the outside temperature. But even in such systems the influx of sun radiation will have to be considered, and for this reason a second sensitive element reacting to the room's air and wall temperatures should be provided. If the heating panels are of smaller inertia than the outside enclosures, the outside temperature is of less importance but will have to be considered in most cases.

Examples

Fig. 5 of the previous installment and 3 to 6 of this article should illustrate some of the principles previously discussed. Fig. 5 in last month's article and Fig. 3 and 4 of this article present radiant heating systems located on the West Coast, installed by Robert Bruen, heating contractor, Berkeley, Calif. Fig. 5 and 6 show systems located in the east, designed by S. A. Selby, Jr., presently of Waterbury, Conn. The procedure of installing coils may vary widely and the technics illustrated should not necessarily be considered as standard installation practice.

Fig. 5 (last month's article) shows a coil more or less typical for aircraft hangars, industrial buildings, etc. Here ½ in. nominal type L soft tempered copper tube is used and laid out on 12 in. centers on top of the reinforcing fabric, located on a thin rough concrete bed. After the coils are wired to the fabric and tested, they are lifted with the fabric and held at an elevation slightly above the center of the final slab. Now concrete may be poured and worked in underneath coil and fabric in the conventional manner and the coil is leveled up. Finally, the upper half of concrete is poured. By working on every other panel strip the interference between steamfitter and concrete mason is reduced to a minimum and the building's completion speeded up.

In Fig. 3, showing a residence in California, Mr. Bruen's prefabricated panel may be seen attached to the ceiling. Here ¼ in. nominal type M sinuous prefabricated copper coils are used with tubes on 4½ in. centers and are fastened with the lath to the ceiling joists. Two inches of rockwool insulation is attached to the joists. This reduces the panel's heat loss to the attic above. An overhead flow main conveys water to all panels and the return is distributed under the floor. Water temperature is 140F and no mixing valve is used. On-off control is provided by room thermostat.

Fig. 4, although presenting a panel heating sys-

Fig. 4. Swimming pool installation.

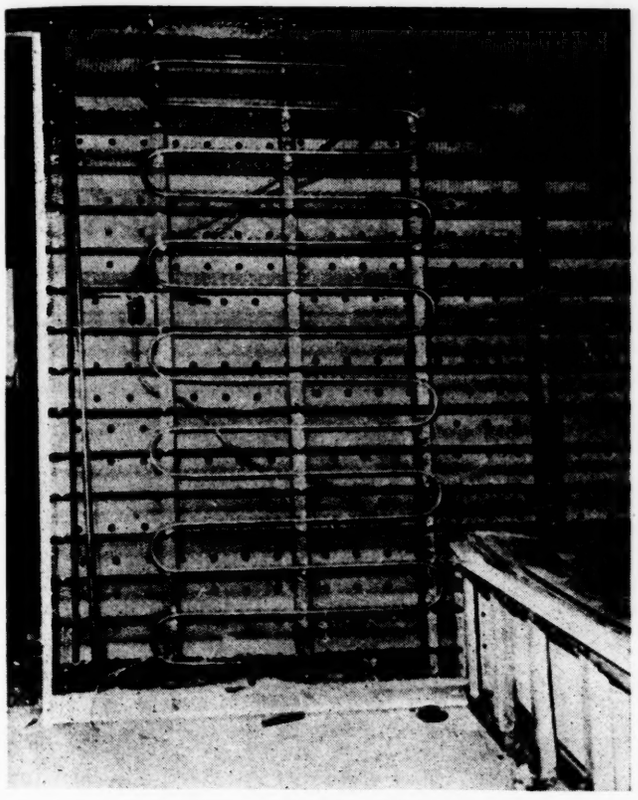


Fig. 5. An eastern wall panel.

tem, does not show a radiant heating system. By the use of sinuous copper coils embedded in the bottom of a swimming pool, the water is heated by convection. For this ½ in. Type L copper tube is used and laid out on 9 in. centers. Length of straight tube runs is 17 ft and the tubes are wired to the reinforcing fabric of the pool's bottom. The system is regulated by an aquastat and the remote bulb submerged in the pool 4 ft below water level at a point where the depth of the pool is 8 ft. Controlled by the water temperature is a motor valve regulating the flow of hot water through the coil. The installation of this system proved so successful in eliminating stratification of the water that, in quick succession, several other pools were provided with the same heating system.

Fig. 5 shows a wall panel in a residence using floor and ceiling panels as well. The coil shown in the figure is fastened over the wire lath by clips. Wall and ceiling coils are made of ⅜ in. nominal tubes on 6 in. centers; floor coils of ½ in. nominal tubes on 12 in. centers, both using type L soft tempered copper tube. The panelled ceilings are insulated by 4 in. batts and all coils embedded in a heavy three-coat gypsum plaster. Individual supply and return lines connect the coils to the cellar distribution. The maximum operating water temperature is 145F and is regulated by a mixing valve which is governed by an outside thermostat. The 1½ in. diameter circulating pump is governed by room thermostat. The boiler temperature is maintained at 180F by aquastat.

Fig. 6, also a residence, shows a ceiling panel laid out according to previously described considerations (see Panel Layout, section 1). It shows a high temperature job using relatively short runs of ⅜ in. nominal, soft copper tube, Type L, which is fastened under the wire lath and to the joists by clips on 16 in. centers; individual supply and return risers and 4 in. insulation on all second floor ceilings are provided. Coils are embedded in three-coat gypsum plaster with scratch finish. Water temperature is 160F. The circulation pump is controlled by room thermostat.

Conclusion

The installation procedure for radiant heating systems using ferrous pipe is fairly well established by literature. However, few publications are available on the design and installation of copper coils.

This and the previous article have attempted to give a few more specific construction details and to show how the general design considerations affect the installation of copper coils.

The next article in Mr. Vanderweil's series will discuss the simple laws of heat transfer and how they may be applied to visualize the flow of heat from the heated panel through the room and its outside enclosures to the surrounding atmosphere.

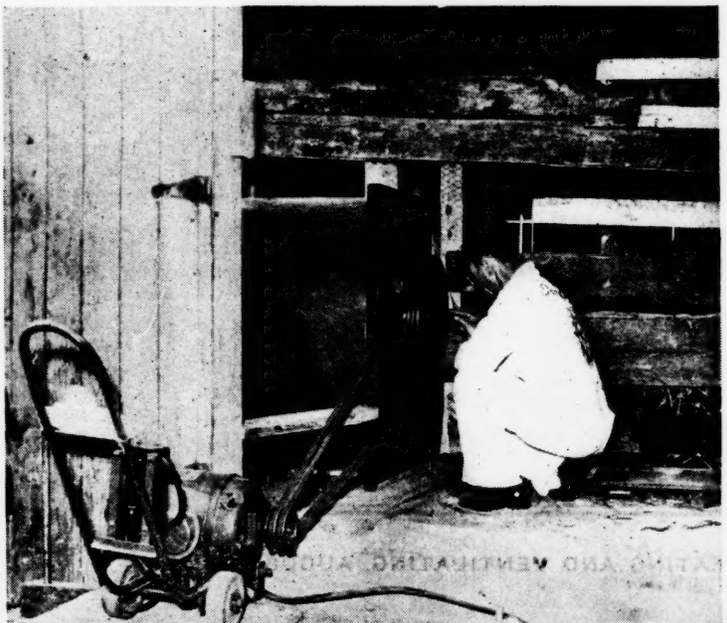
Fig. 6. Piping in a Connecticut residence.

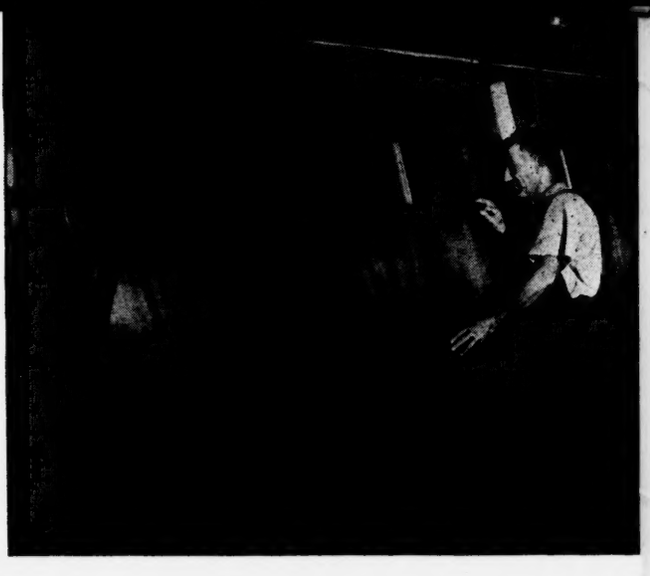
Picture Paragraphs

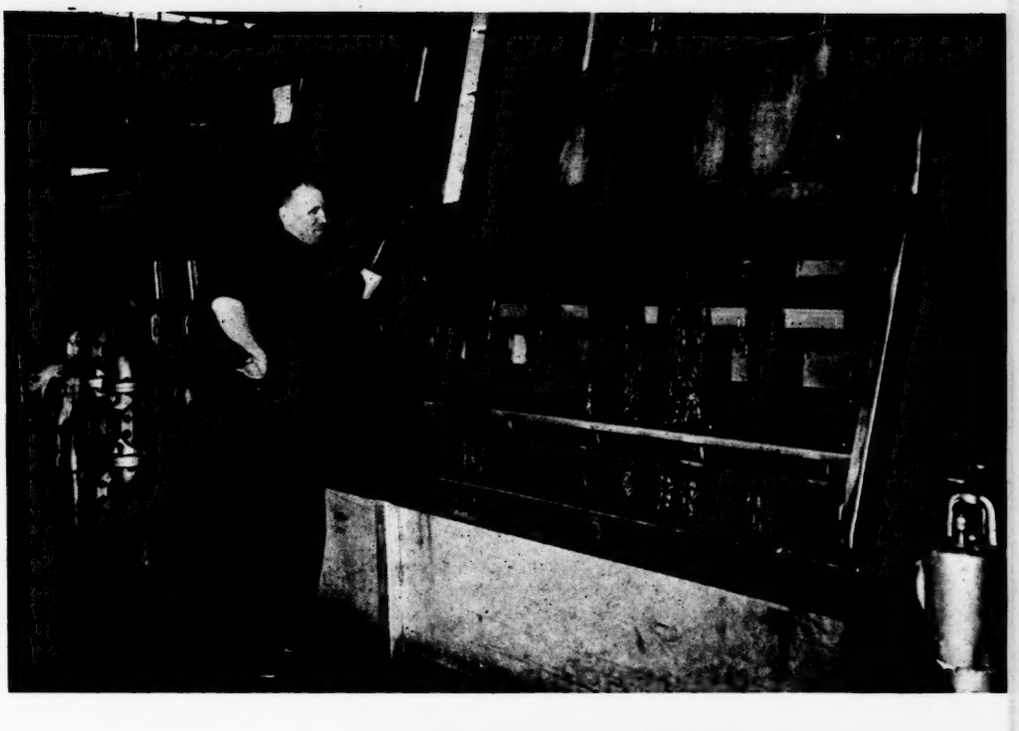
In the schools of Cayuga County, the New York State Department of Health is conducting experiments in the control of air-borne infections. Shown above is the cafeteria of the Cato-Meridian School where air is treated by ultraviolet light directed toward the ceiling by General Electric lamps strung along side walls above the level of children's heads. Shown at right is a typical classroom at the Port Byron School where similar lamps are used. In the center of the room is a Wells centrifuge for sampling air bacteria. Air is also sampled in non-irradiated classrooms for comparison.

Cargo and crew aboard Boeing C-97 are protected by Fiberglas heat and sound insulating lining shown between circumferentials below.

Westinghouse photo below shows electrically driven blower used for drying hay at Texas A & M College. One user of this comparatively new idea in farming field-dries hay for only about five hours, then puts it into the mow and turns on the electric blower. He says his hay is perfectly cured in ten days to two weeks.

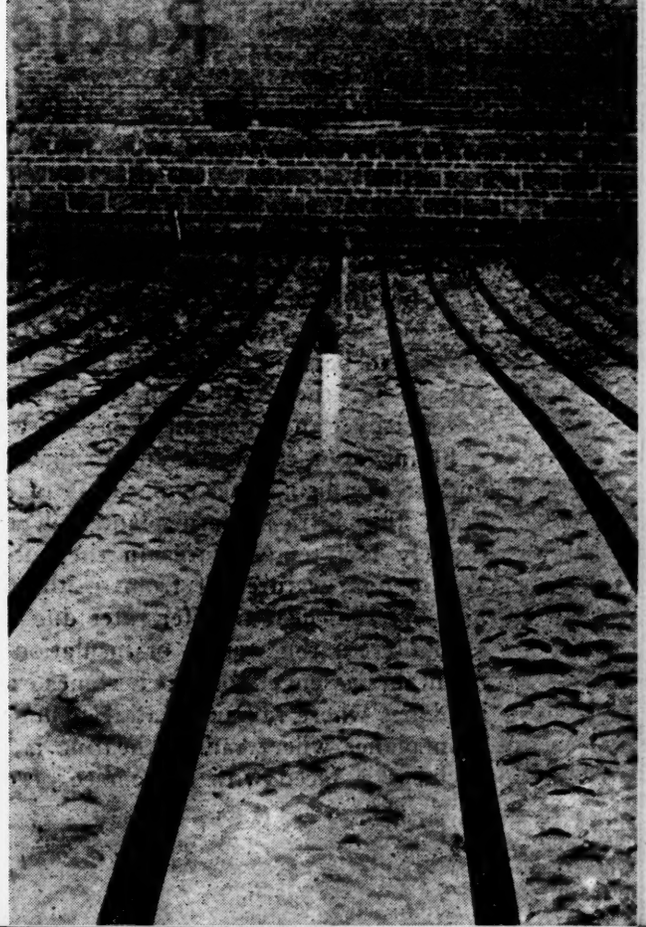


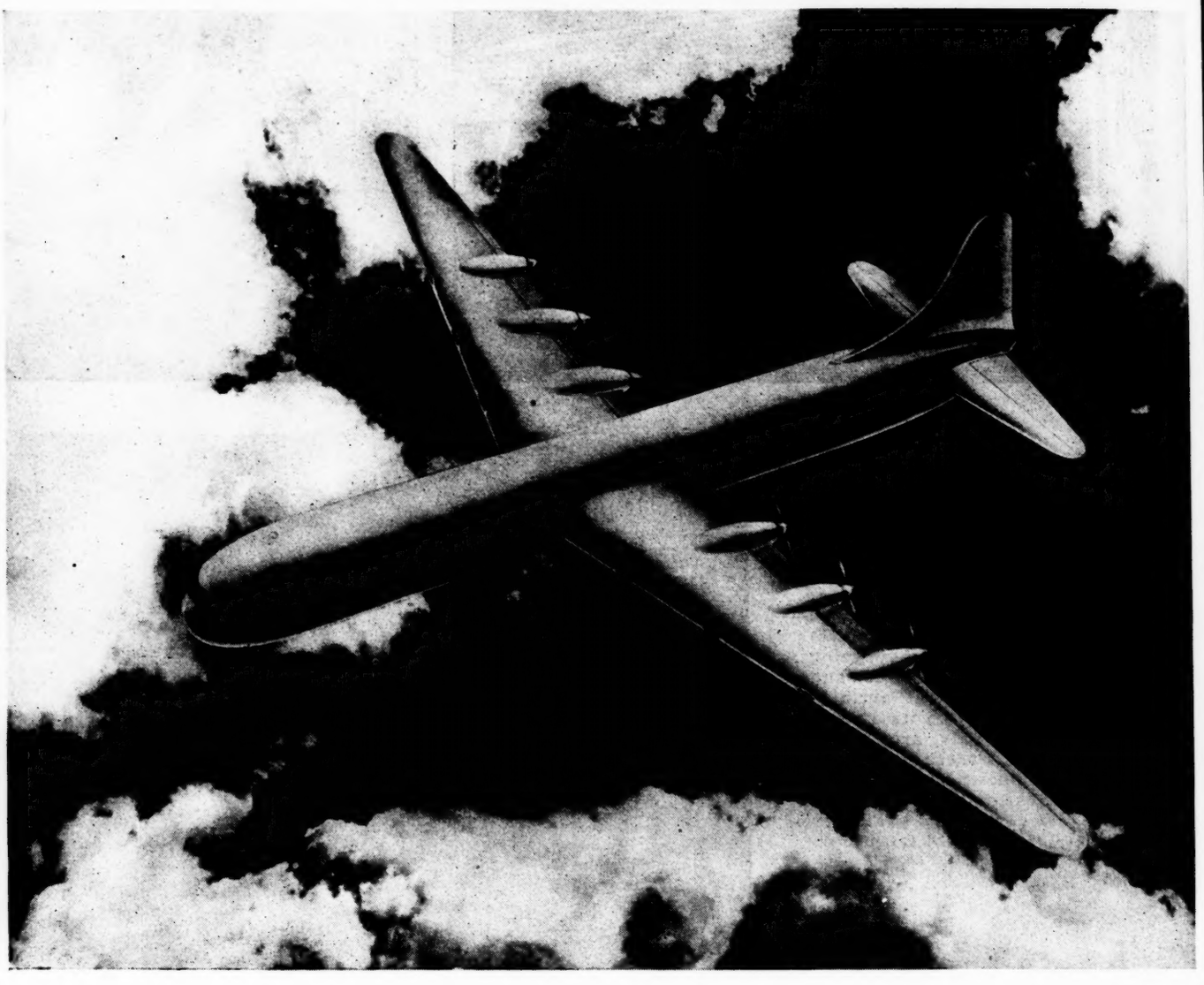




Three U. S. Public Health Service photos illustrate environment control by process enclosure in the dyeing industry. (See Skinner, Pierce, and Hosey article, page 61.) Fabric is fed into rollers in dye vats (above left). Covers on vats are closed (above right) and process is watched through glass windows in cover. After dyeing process is completed, the bath is drained away and the vat cover opened (right) to cool fabrics.

A. M. Byers Co. says Jewell Valley, Va., theater (below) is the first motion picture house in the United States to use floor type radiant heating. Pipe grid (right) is of 1¼ in. wrought iron welded together at the site. A 5 in. concrete slab poured over this pipe serves as the theater floor.





204-passenger plane to have

Radiant Wall Heating

HOWARD SCHMIDT

Development Engineer, Consolidated Vultee Aircraft Corp.

AERONAUTICAL engineers consider radiant wall heating an essential type of cabin comfortization for luxury aircraft. This is the type of heating system to be incorporated in Consolidated Vultee's Model 37, the 204-passenger transocean airliner ordered by Pan American World Airways.

Flying at a ceiling of approximately 30,000 feet and at a cruising speed in excess of 300 miles per hour, this ultra-modern plane will encounter extremely low temperatures in the sub-stratosphere. Where temperatures of from —20F to —65F and high external heat transfer rates due to velocity are encountered, the weight of insulation necessary to maintain passenger comfort becomes excessively high in planes where radiant heating is not used.

In planes where radiant heating is not used, the engineer is faced with the choice of maintaining a balance between thickness of wall insulation and thermal energy supplied to passengers.

No problem would exist if insulation of sufficient thickness could be used. With such a setup, only theoretically possible of course, the passenger would require merely a supply of air at normal room temperature of 65 to 70F, and at velocities sufficient to meet his respiratory requirements without uncomfortable drafts.

Inasmuch as the quantity of insulation carried is largely governed by weight and space aspects, it is necessary that as little insulation as possible be used. At high altitudes, heat loss from moderately insulated walls becomes extremely high. Utilization of the familiar hot air system under normal flight conditions of the Model 37 would require convective air at temperatures far above the respiratory comfort

range to maintain bodily warmth. Such temperatures induce drowsiness and extreme discomfort.

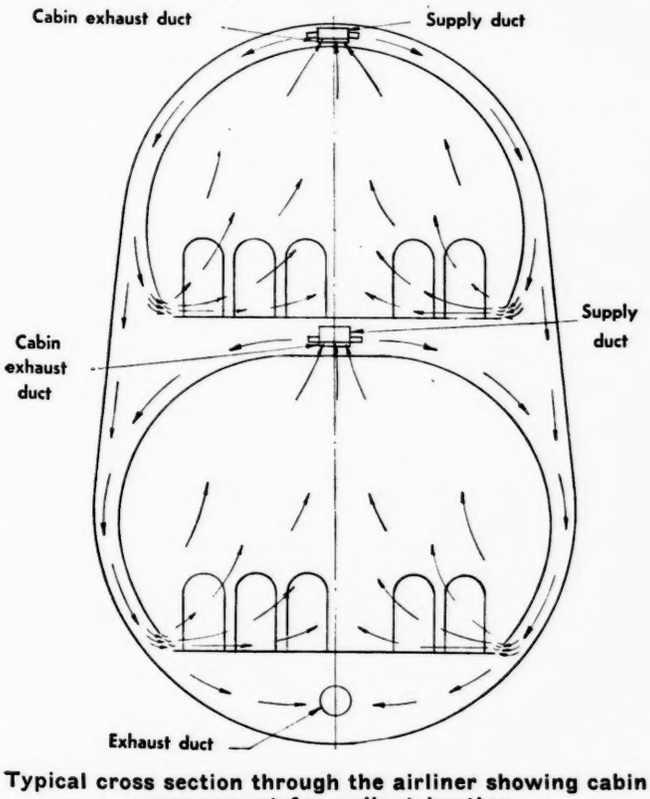
In radiant heating, hot air is passed through wall spaces in place of insulation, and in addition, heating inner walls slightly above body temperature does away with the radiational unbalance which formerly tended to draw heat from the passenger through the cold wall. Thus, in effect, a heavy static insulation is replaced with an almost weightless dynamic insulation of warmed air.

The heating function is separated from the respiratory or ventilating function. Ventilating air can be supplied at comfortable velocities and properly humidified temperatures. All thermal energy is supplied from the walls which, it has been found, should be heated to approximately 100F.

The study of this type of heating, which has been used for some time in modern buildings, resolved itself into finding a method of raising the temperature of the inside surface of the cabin walls and to discover what results this would have on the cabin heating system.

It was decided that an air gap should be provided between the several layers of soundproofing and insulation so that hot air could be passed through cabin walls. Calculations proved that the best method of accomplishing this was to use two one-half inch layers of insulation to form the outside wall of the air gap, and one layer, plus interior trim, as the inside wall. In this manner heat loss to the outside air was kept at a minimum and the heat supplied to the cabin by conduction was of a desirable quantity.

In the radiant system, hot air is supplied by ceiling ducts running the entire length of the cabins. The fuselage has a continuous air space through which the hot air circulates, heating the ceilings, walls and floors. The air is exhausted through a duct running beneath the lower floor after a limited amount is actually admitted into the cabins at floor level.



Typical cross section through the airliner showing cabin arrangement for radiant heating.

Facts About the Transport Plane

The heating facilities are sufficient to heat a 40-room apartment house.

The fuel required to completely fill the tanks is more than the average motorist would use in 20 years.

The electrical system is equivalent to that used by a town of 500 persons.

There are approximately 25 miles of wire in one airplane.

The main landing gear tire is approximately one foot greater in height than the average ceiling in a home.

The tail extends to the height of a 5-story building.

The propellers extend higher than a 2-story home.

Warm air also circulates in the space between the double paned windows. The duct which supplies heated air to the cabin walls also serves to carry heat to the empennage for anti-icing. Ram pressure driving the air through heaters and ducts is aided by tail end suction.

Since a normal person must give off 400 Btu per hour, and since his heat loss by radiation has been reduced considerably, the cabin air temperature may be decreased without reducing the effective or mean radiant temperature (comfort temperature). This permissible drop in cabin air temperature is believed to have a beneficial effect on passengers subject to airsickness. It was found that ventilating air at 60F could be admitted to the cabin. The amount of heat conducted into the cabin through the walls would then heat the ventilating air from 60F to the average cabin temperature of 65F.

It was found that the hot air from one heat exchanger, when properly mixed with outside air, would be sufficient to heat the walls of the cabin, and the hot air from a second exchanger could be used to pre-heat the ventilating air to 60F.

At low altitude during extreme icing conditions, the wall heating system may be closed off and the hot air used to anti-ice the pilot's windshield as well as the empennage.

One heat exchanger is installed in the exhaust of each engine with an output per unit of 185,000 Btu per hour at cruising speed, and 265,000 Btu per hour maximum. Heat from the outboard engines protects the outer wing panels from icing. The middle engines on each wing provide heat for the leading edges, and the inboard engines supply heat for the cabin heating system. The entire system is fully automatic, compensating for varying densities of air under operating conditions.

Correcting mistakes in

Fan Duct and Fan Connection Design

JOHN CASSIE
Installation Analysis Department, B. F. Sturtevant Co.

MOST designers of duct systems are familiar with rules in accepted handbooks for calculating the frictional losses in such elements as straight sections, elbows, transitions, etc. Friction in such elements as heater coils are usually taken from a manufacturer's catalog to suit these requirements.

But too many times the "as installed" system performance falls short of the "as designed" figures. The question arises, "Why?"

Probably the most effective way to answer such a question is to study a specific example. Consider a system being designed to include the elements shown in Fig. 1. The engineer, knowing the designed velocity at each point of the system, refers to his handbook and selects the pressure loss for each duct, elbow or transition as shown. He decides upon the coil resistance from the catalog and can now calculate the summation of the pressure drops which the fan must overcome; he also knows the total volume of air the fan is to handle.

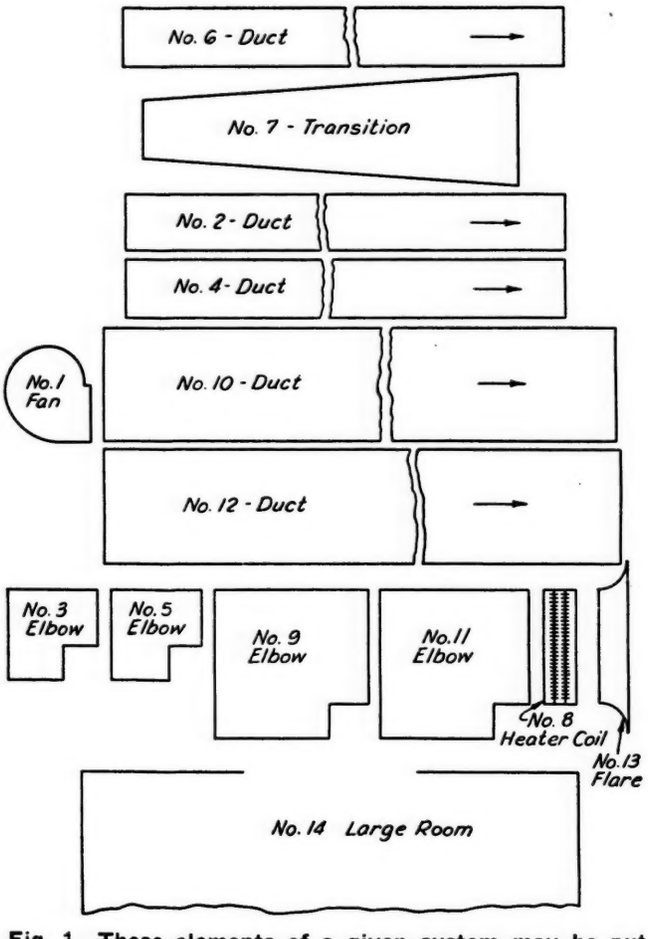


Fig. 1. These elements of a given system may be put together in more than one sequence as in Figs. 2 and 3.

All the elements of Fig. 1 are now erected as shown in Fig 2. An accurate measurement of volume and pressure is obtained at the downstream end of duct 2. The test figures show the system design figures very closely and all interested parties are highly gratified.

Suppose now, that the building burns down. After the fire it is discovered that the entire system can be salvaged. In replacing the building itself, a different floor plan is decided upon. The same elements of Fig. 1 and Fig. 2 are used—no more—no less as shown in Fig. 3. Much to everyone's consternation, however, the capacity of the system has been reduced by over 50%. Although much time and effort are spent in chasing down the cause, the investigation leads one to suspect the catalog rating. This example may look like an exaggeration; however, many such disappointing situations have been experienced. Fortunately, most such cases can be and have been corrected almost wholly by inexpensive sheet metal alterations.

By far the most important section of the system is the fan, and the type of connections leading to it and from it. Most fan manufacturers subscribe to the method of rating set up by the National Association of Fan Manufacturers. This method of rating is the standard test code of the association. In the case of Fig. 2, an open inlet fan is set up with a long test duct attached to the fan discharge. Determinations are made rather far from the fan discharge, toward the downstream end of this duct. The performance thus determined will be the same in the field only when the laboratory setup is duplicated. We have such a duplication in Fig. 2, and we therefore expect and obtain duplication of performance.

Next, consider the elbow in the system. Usually data in handbooks cover only the loss for an elbow tested from straight duct approaching and leaving the elbow. This condition exists in Fig. 2. The data have thus been properly applied. The same applies to the heater coils. Thus there is no reason why the system shown in Fig. 2 should not produce the designed results.

Consider the revised system in Fig. 3. Air flows from duct 12 in a smooth, uniform velocity stream. However, the air, in passing through elbow 11 is given a spin in the same direction as wheel rotation. The fact that the centerline of the fan is offset from that of duct 12 causes more air to flow into the left half of the inlet than into the right. This accentuates the spinning effect.

When air enters the wheel with a spin, the effective blade angles are altered. The head of pressure and the volume are seriously altered; the efficiency is also altered. The resulting fan performance bears

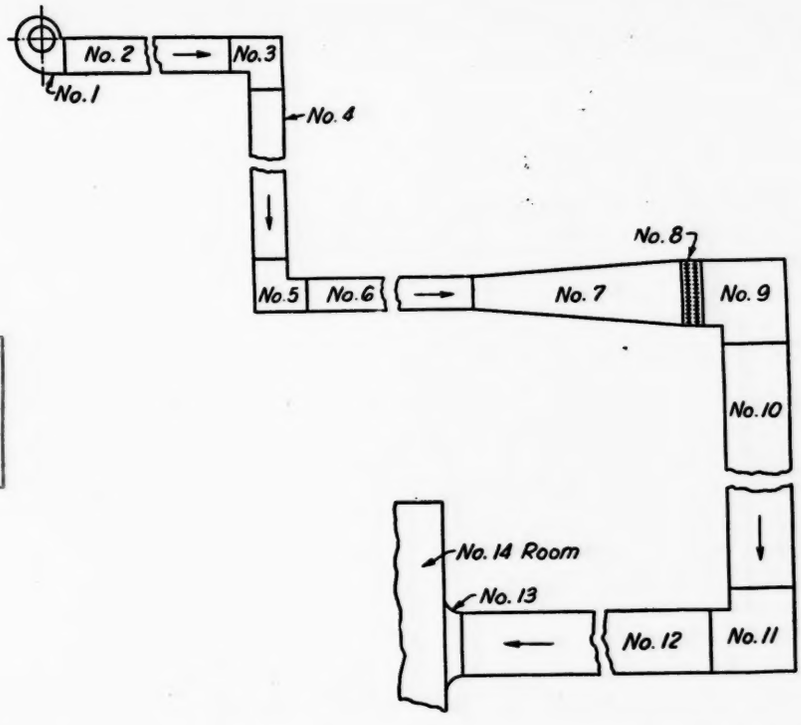


Fig. 2. Elements shown in Fig. 1 may be set up in this sequence. The engineer, knowing designed velocity at each point, refers to his handbook and calculates the sum of pressure drops the fan must overcome. The same elements are rearranged in Fig. 3.

Note:—When elements are rearranged, the designer must be careful to note whether added turbulence will throw off handbook data taken from test conditions which are not duplicated in his new setup.

little resemblance to that obtained from testing the same physical fan in the laboratory. With a compound elbow such as the two elbows No. 3 and No. 5 in Fig. 3 placed directly at the discharge, the air is not given a chance to fill fully the available physical duct areas, but a serious turbulence results. This affects the fan performance and usually causes the loss for the two elbows to be several times the figure given in the handbooks.

The air in the system of Fig. 3 finally straightens out into a smooth stream before passing through ducts 4 and 6 and transition 7. Then elbow 9 changes the air's direction and causes turbulence again. The stream is crowded to the outside of the elbow; the air nearest the inside corner of the elbow is turbulent. Thus, when the air reaches the tube fins it contacts them at various angles, similar to the flow of air approaching a partially closed louver damper. The loss through the coil is thus increased to a figure much exceeding the coil manufacturer's rating.

It will thus be seen that the usual friction loss consideration may not be nearly as important as the losses caused by turbulence, particularly near the fan. When data are taken out of handbooks and catalogs the designer must give much thought to whether the conditions existing in his proposed system duplicate those of the test setup from which the data were obtained.—*From a talk by the author before the Massachusetts chapter, ASHVE.*

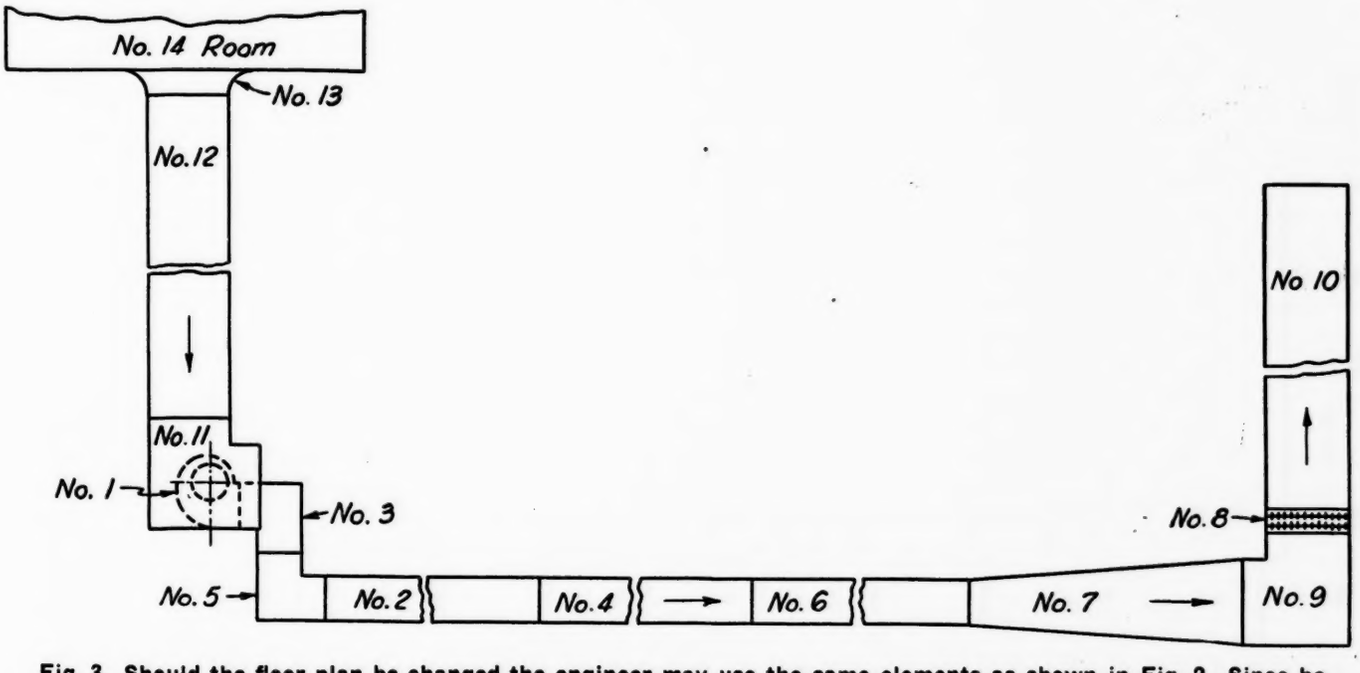


Fig. 3. Should the floor plan be changed the engineer may use the same elements as shown in Fig. 2. Since he wants to move the same volume of air through the same elements, he may be surprised to find that the capacity has dropped by as much as 50%. Note that in the rev.sed system the fan discharges against a double elbow throwing handboo : data out of line.

Individual gas-fired boilers serve this Arna Valley Project near Washington, D. C.

Heating Unit Apartments by Gas

C. F. CUSHING

Distribution Manager, The Bryant Heater Co., Cleveland, Ohio

WHILE the war's outbreak halted installation of individual gas-fired heating units in garden apartment houses, many thousand multiple-dwelling war housing projects selected this type of heating. Today, such installations have proved valuable guinea pigs; the performance data gathered offer an unusual means of appraising this type of heating.

The building boom predicted by forecasters, both government and private, for the immediate post-war period includes the construction of many apartment houses and multiple family dwellings. Furnishing heat to an apartment is one of the major problems of builder, owner, or manager. Facts and figures gathered since the first gas-fired forced-air individual units were installed in the Park Lake apartments in Boston now give the heating engineer and apartment house owner a reliable yardstick for measuring the results he can expect from this type installation, in which each dwelling unit has its exclusive source of heat, responsive to the tenant's own thermostatic control.

Usually, under this plan, the gas furnace is tucked away in a service closet or in a similarly small kitchen space, with hot air ducts leading to wall outlets in other rooms.

The individual occupant's temperature whims are compensated for by unit-heating control. It becomes unnecessary to furnish enough heat to keep the entire apartment house at 75F just because one tenant complains if the temperature drops below that point. Elimination of this heat waste is reflected in lower costs. With individual meters for every unit, each tenant can buy as much heat as he wants. A corollary advantage with individual meters comes from the fact that the building owner can advertise lower rents. A further tangible saving as a result of unit heating is the elimination of labor costs for firing central coal boilers, and for removing and carrying out ashes. This labor often amounts to the rental of one apartment and, in any case, the decentralization of heating frees rentable space otherwise required by a central plant and its fuel storage.

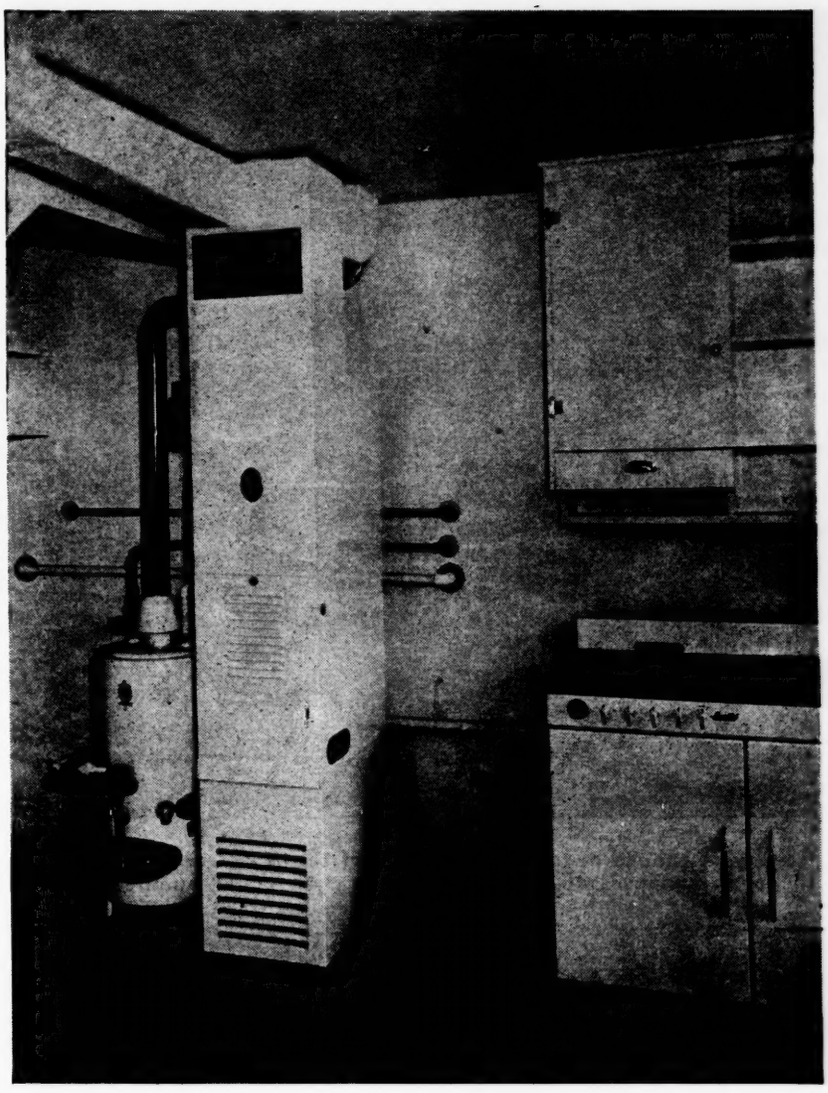
Gas winter air conditioning units require an occasional adjustment of controls, and annual replacement of filters. The reduction of cleaning and decorating expenses through the use of these filters more than offsets this cost, however, while accumulated repairs to a central steam heating plant counterbalance maintenance of the individual units.

Apartment houses built before the war, and defense housing projects built in more recent years, furnish the best statistics on actual operation costs of unit heating with natural, manufactured or mixed gas under a variety of weather conditions.

Heating Costs

The Passyunk Homes development in Philadelphia, Pa., is a typical example. A U. S. Housing Authority project, it was built for civilian and enlisted personnel of a naval yard and merchant marine base and houses 3,600 persons in 12 apartment buildings and 117 two-story row buildings. Size of the individual apartment ranges from one to three bedrooms. All use gas for cooking, refrigeration, water heating and individual forced air furnaces. Manufactured gas was supplied by the utility company to the project. Cost for all gas used averaged $5.05 monthly during a year in which seasonal temperatures were within 1% of normal.

Other Philadelphia installations provide a similar picture. One project of 264 units, each with 3½



Through units such as this one, tenants have control over the heat in their respective apartments.

rooms and using gas for everything except refrigeration, averaged costs of $5.82 per dwelling during 1943. Another, with 32 units, averaged $5.58 per month during 1942 and $5.73 per month during 1943. A third, with 28 units and utilizing gas for refrigeration as well as space heating, hot water, and cooking, averaged $6.12 and $6.52 for the same period. In an area where the number of normal degree days is 4749, these costs were achieved with manufactured gas having 530 Btu per cu ft.

Cleveland offers comparative figures for unit heating with natural gas. Eight apartment houses built in the year immediately preceding the war have compiled average monthly cost records of $.44 for cooking, $.62 for refrigeration, $1.22 for hot water, and $2.47 for space heating, or a total of $4.75 per month. Cleveland, which has 6171 normal degree days, has a natural gas containing 1100 Btu per cu ft.

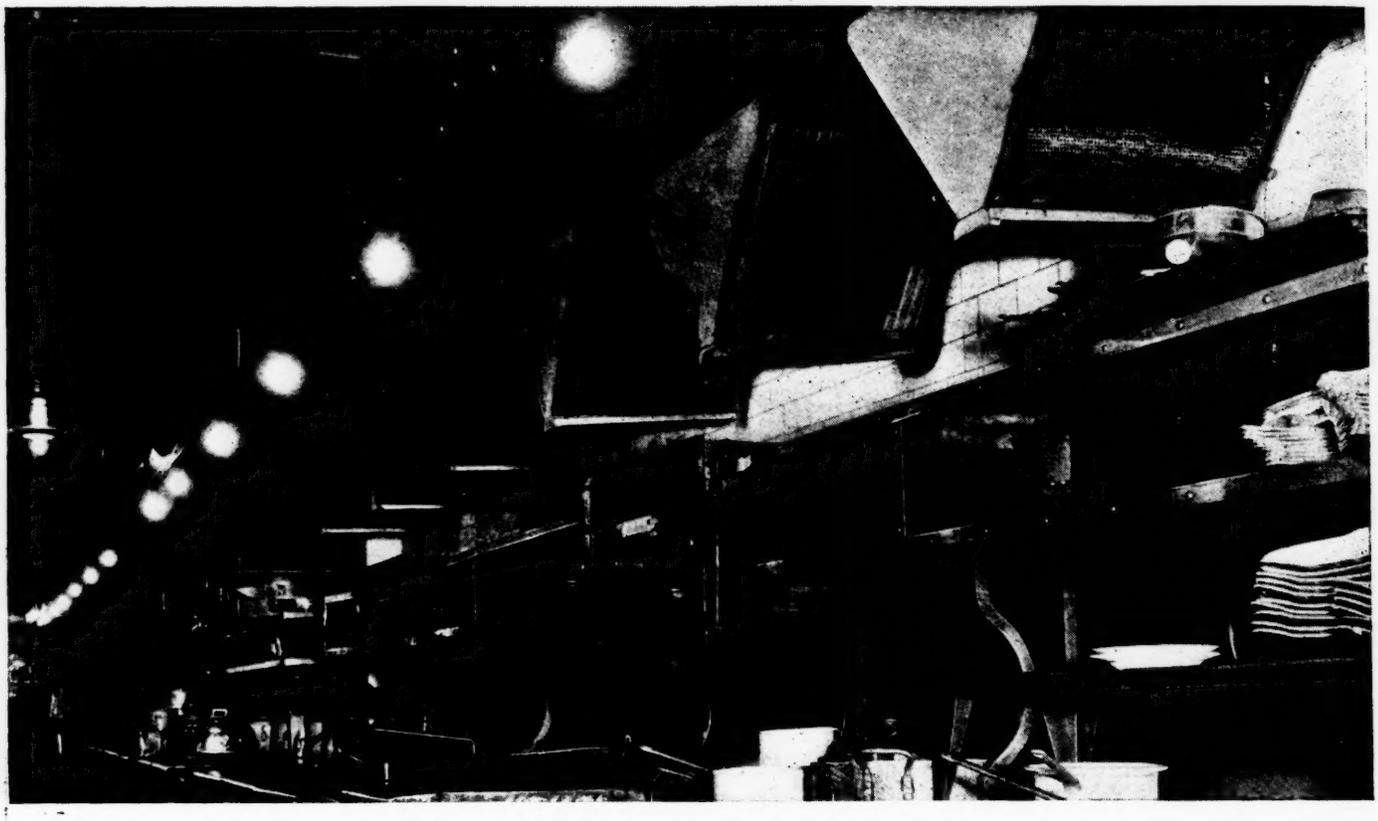
Project Near Washington, D. C.

The Arna Valley Project near Washington offers a comparison based on mixed gas. Here individual gas fired boilers rather than forced air gas furnaces supplied heat for the apartments. Results, however, were almost the same. Heating costs for a second floor apartment totaled $35.82 for the year—$2.98 per month. A first floor apartment averaged $38.89. The highest bill run up by any tenant in the entire development was one of $51.54, and in this case the tenant desired and maintained an inside temperature of 80 degrees. Washington's total normal degree days is 4598. Its mixed gas has a value of 604 Btu per cu ft.

Compare the average gas bill of the Cleveland installations, $4.75 per month or a total of $51.00 per year, with heating costs of a central coal-fired boiler system. It would be conservative to assume that a six-unit apartment house could be heated for a year with 24 tons of coal, four tons for each unit. Assume also that coal could be bought for $7 a ton, making a total cost of the coal for the year $168. Suppose that one of the tenants could be persuaded to fire the furnace in return for a 50 per cent reduction in rent and that the rent is $60 per month. This makes the firing cost $30 a month or $360 a year. Even under these favorable conditions the yearly cost of heating the apartment house would be $528, or $88 per unit, $37 per suite greater than the average Cleveland installation studied. In addition, this gas bill covers not only heating and hot water, but cooking and refrigeration as well.

Development work is continually in progress toward decreasing the space required for the individual unit gas-fired furnace. Prior to the war the Bryant Heater Co. manufactured a vertical burner that could be installed in a closet 2½ ft square. Efficiency of this type of equipment is near its peak, with thermal efficiency ratings of 80%.

There is hardly any doubt that the predicted post-war building boom will see a resumption of the trend toward individual suite heating with gas in multiple family dwellings. In addition to tenant sales appeal and user satisfaction, which will again be prime considerations after the war, unit gas heating will be an important factor in new apartment construction, because of the low operational, maintenance and depreciation costs already thoroughly demonstrated in wartime housing.



Battery of ranges in the main kitchen of the Biltmore Hotel with 26 filters installed at 13 ports to admit air from the oven canopy into the exhaust duct. An equal number of smaller filters is mounted on the other side of the white brick wall.

Removing Grease From Kitchen Vapors

FRED A. HERR

Filters installed in Los Angeles' largest hotel have prevented grease-laden air entering the building's main ventilating ducts. Flash fires are no longer a hazard to ducts.

FOR a number of years the Biltmore, Los Angeles, was confronted by the task of separating grease from air which rises in large volume from batteries of ranges, broilers and soup caldrons in the hotel's great sub-basement kitchens. All air from the kitchens is exhausted into a 4 ft diameter vertical duct which rises from the basement, through the eleven floors of the building, to the roof.

Grease-laden air is funneled into the duct by a hood 65 ft long by 9 ft wide, mounted over a long double row of cooking units where the greasy vapors originate. The full 65 ft length of one side is occupied by natural gas burning ranges, which are operated day and night for broiling and frying fish, steaks and chops. Back-to-back to the ranges, and separated from them by a white enamel brick wall, 8 ft high, stand two additional gas ranges, two large bake ovens, three steam broilers, and a dozen or so aluminum kettles. These containers hold from 25 to 100 gal each.

Duct Walls Grease-Lined

For several years the Biltmore Hotel management had been spending from $500 to $600 annually to have the accumulated grease scraped from the inner walls of the master duct. This work had to be done at least every three months, some years as often as every two months. In addition to the expense, this procedure was inconvenient, for the work had to be done at rare periods when the kitchen was not in active use.

Attempts had been made to overcome the problem of excessive grease entering the duct by mounting filters of various types across the ports of the duct that open into the oven hood. The hotel management reported that in each instance it was found the filters then used loaded up too rapidly and created a high restriction in the exhaust system. An additional disadvantage was the fire hazard. The installations then used permitted flames from flash-ups on the ranges to be drawn through the filters into the duct. Flash-ups are of not infrequent occurrence in a large hotel kitchen where great volumes of greasy food are in nearly continuous preparation all day long. On several occasions the exhaust fan had drawn flames from a flash-up into the duct, causing the grease-covered duct walls to burst into flame, a highly dangerous condition.

The Biltmore management ultimately called into consultation representatives of Treidler & Gratiot. What the hotel company sought was a filter system which would catch the cooking vapors before they would pass into the duct.

The system installed consists of Air-Maze Grease-top bronze filters mounted in two banks just below the canopy over the ovens and kettles. One bank of 26 single or 13 double units was placed on either side of the enamel brick wall. The units employ the baffle impingement progressive density principle, and consist of laminated hardware cloth, or mesh wire, of varying sizes. They are held together by 16-gauge steel enclosing frames.

Exhaust air from the hood amounts to 22,000 cfm, and due to limitations of space, a somewhat higher velocity than usual is maintained across the filters. The efficiency of drawing air into the duct was not impaired in any way by the filter installation.

In order to balance the system by establishing equal resistance at all openings, two sizes of filters were installed. Twenty-six V-type filters, 9x13x2 in. in size were installed in dual sets in the 13 hood openings on the side where the soup kettles, bake ovens and broilers operate. On the other side of the canopy, an equal number of 20x20x2-in. filters and holding frames were installed, with a dual set of units in V arrangement mounted under each of the 13 ports opening into the canopy. The ports are spaced equally the entire length of the oven and kettle lineup, being some 4 ft above the tops of the ovens and 7 ft above floor level. Each filter has two lifting handles and is held in the holding frame by spring clips, which simplifies removal for cleaning.

The rated air capacity of the units installed in the Biltmore Hotel is one-half to one cfm per sq in. of panel surface for natural draft and one to 1½ cfm per sq in. of panel area for forced draft. For highest efficiency, the recommended requirement of the Biltmore installation is the equivalent of 1½ cfm per sq in. of filter area. The filtering efficiency is rated at 98.5 to 99.83% entrained grease and dust. The holding capacity of the 20x20x2-in. units until servicing is required is approximately 560 grams collected material.

The filter panels now in use are serviced once a week, being cleaned with steam in a simple operation, dried, and then replaced in the canopy. This involves no interruption of kitchen service. The filters are cleaned by sections, with spare units on hand to replace those being cleaned and dried.

Flames Kept Out of Duct

The present installation has entirely eliminated the danger of fires in the main duct resulting from oven flash-ups, for flames normally cannot penetrate the filter itself. Since most of the fires are of the flash type, which ordinarily do not last long, the flames expend themselves against the face of the filters and cannot enter the duct. Several cases occurred during the past six months where the present filter system has prevented what might otherwise have been serious fires in the main duct.

The hotel management reported that it has been successful in obtaining a material reduction in its fire insurance rates since the present filter system was installed.

Building Construction in 1945

Estimated construction expenditures in the United States totaled nearly $2.5 billion for the first six months of 1945, approximately 10% above the first half of 1944 but about 20% short of the prewar levels of 1939 and 1940. These data, as also shown below, are those of the U. S. Department of Labor.

ESTIMATED CONSTRUCTION EXPENDITURES IN THE CONTINENTAL UNITED STATES, IN MILLIONS OF DOLLARS
FIRST HALF 1939-1945[1]

Type of Construction	First half of—						
	1945[2]	1944[3]	1943[3]	1942[3]	1941[3]	1940[3]	1939[3]
Total construction	$2,481	$2,240	$4,758	$6,162	$4,788	$3,122	$3,086
Private construction	1,408	1,113	1,097	2,109	2,619	2,126	1,912
Residential building (nonfarm)[4]	317	361	326	954	1,358	1,145	1,123
Nonresidential building[4]	588	256	269	531	689	477	371
Industrial	375	154	188	217	337	186	115
Commercial	120	46	30	208	222	197	148
All other	93	56	51	106	130	94	108
Farm construction[5]	220	238	253	285	250	217	212
Residential	58	65	71	121	105	95	94
Nonresidential	162	173	182	164	145	122	118
Public utility	283	258	249	339	322	287	206
Public construction	1,073	1,127	3,661	4,053	2,169	996	1,174
Residential building	51	131	393	174	195	88	23
Nonresidential building (except military and naval facilities)	503	352	1,282	1,473	587	218	455
Industrial facilities[6]	429	299	1,218	1,384	470	25	9
All other	74	53	64	89	117	193	446
Military and naval facilities	314	384	1,552	1,841	760	82	56
Highway	107	137	180	300	300	302	314
Other public	98	123	254	265	327	306	326
Federal[7]	53	74	179	172	192	151	140
State and local[8]	45	49	75	93	135	155	186

[1]Unless otherwise stated, the estimates cover only expenditures for new construction, major additions, and alterations. The estimates for 1944 and 1945 were prepared in cooperation with the Bureau of Foreign and Domestic Commerce and the War Production Board.
[2]Preliminary.
[3]Revised.
[4]Includes repair work of those types for which building permits are generally issued.
[5]Includes expenditures for maintenance and repair work.
[6]Excludes expenditures for floating dry docks.
[7]Mainly river, harbor, flood control, and reclamation projects.
[8]Includes water supply, sewage disposal, and miscellaneous public-service enterprises.

Degree-Days for June, 1945

HEATING AND VENTILATING'S 18TH YEAR OF PUBLICATION OF MONTHLY DEGREE-DAY DATA

CITY	JUNE			CUMULATIVE, SEPTEMBER 1 TO JUNE 30			HEATING SEASON[1]
	1945	1944	NORMAL	1945	1944	NORMAL	NORMAL
Abilene, Texas	1	0	0	2485	2530	2061	2061
Albany, New York	118	52	0	6911	7174	6580	6580
Albuquerque, New Mexico	11	3	0	4314	4863	4298	4298
Alpena, Michigan	214	142	138	7875	7959	8265	8299*
Anaconda, Montana	—	381	251	—	8110	8261	8357**
Asheville, North Carolina	32	0	0	3812	4214	4232	4232
Atlanta, Georgia	1	0	0	2847	2939	2890	2890
Atlantic City, New Jersey	65	20	0	4826	4974	5176	5176
Augusta, Georgia	0	0	0	2099	2271	2161	2161
Baker, Oregon	274	263	213	6881	6940	7163	7163
Baltimore, Maryland	28	6	0	4242	4451	4533	4533
Billings, Montana	242	204	60	7065	6570	7119	7119
Binghamton, New York	130	60	0	6677	6985	6808	6808
Birmingham, Alabama	0	0	0	2632	2916	2352	2352
Bismarck, North Dakota	249	117	45	8663	8136	9192	9192
Block Island, Rhode Island	110	85	99	5718	5852	5788	5788
Boise, Idaho	171	167	0	5814	6002	5552	5552
Boston, Massachusetts	94	76	0	5797	6062	6045	6045
Bozeman, Montana	375	333	230	8099	7971	8425	8521**
Buffalo, New York	145	58	12	6820	6962	6822	6822
Burlington, Vermont	109	89	3	7719	8130	7514	7514
Butte, Montana	385	342	236	8539	8662	8162	8272
Cairo, Illinois	19	1	0	3828	3962	3909	3909
Canton, New York	119	86	0	8030	8141	8020	8020
Charles City, Iowa	136	57	0	7451	7388	7588	7588
Charleston, South Carolina	0	0	0	1784	1874	1769	1769
Charlotte, North Carolina	5	0	0	3024	3125	3120	3120
Chattanooga, Tennessee	7	0	0	3387	3587	3118	3118
Cheyenne, Wyoming	299	186	126	7535	7531	7466	7466
Chicago, Illinois	112	43	0	6087	6424	5957	5957
Cincinnati, Ohio	52	10	0	4984	4937	4684	4684
Cleveland, Ohio	106	24	0	6035	6010	6155	6155
Columbia, Missouri	50	14	0	4984	5234	4922	4922
Columbia, South Carolina	0	0	0	2325	2474	2364	2364
Columbus, Ohio	56	10	0	5407	5367	5398	5398
Concord, New Hampshire	118	109	54	7359	7733	7353	7353
Concordia, Kansas	79	15	0	5093	5672	5315	5315
Dallas, Texas	0	0	0	2232	2436	2256	2256
Davenport, Iowa	71	20	0	6036	6205	6289	6289
Dayton, Ohio	63	12	0	5786	5783	5264	5264
Denver, Colorado	142	48	0	5651	5842	5874	5874
Des Moines, Iowa	87	34	0	6186	6440	6384	6384
Detroit, Michigan	116	28	0	6411	6589	6490	6490
Devils Lake, North Dakota	252	147	96	9435	9200	9970	9970
Dodge City, Kansas	182	10	0	5155	5551	5035	5035
Dubuque, Iowa	101	40	0	6623	6738	6790	6790
Duluth, Minnesota	315	237	216	9164	9252	9483	9483
Eastport, Maine	316	322	300	7729	8178	8241	8520**
Elkins, West Virginia	95	41	0	5832	5821	5697	5697
El Paso, Texas	0	0	0	2546	2812	2428	2428
Ely, Nevada	350	352	—	8110	8123	—	—
Erie, Pennsylvania	129	37	0	6073	6388	6273	6273
Escanaba, Michigan	216	153	138	8418	8246	8746	8771*
Evansville, Indiana	36	12	0	4657	4788	4244	4244
Fort Smith, Arkansas	1	0	0	3076	3247	3147	3147
Fort Wayne, Indiana	84	31	0	6523	6606	5925	5925
Fort Worth, Texas	0	0	0	2257	2385	2148	2148
Fresno, California	0	9	0	2690	2573	2334	2334
Galveston, Texas	0	0	0	976	1163	1016	1016
Grand Junction, Colorado	61	31	0	5061	5470	5548	5548
Grand Rapids, Michigan	105	38	0	6339	6611	6535	6535
Green Bay, Wisconsin	160	59	0	7631	7651	7825	7825
Greensboro, North Carolina	30	0	0	3803	4055	3529	3529
Greenville, South Carolina	4	0	0	3013	3168	3380	3380
Harrisburg, Pennsylvania	61	16	0	5276	5503	5375	5375
Hartford, Connecticut	95	43	0	6209	6327	6036	6036
Hatteras, North Carolina	2	0	0	2664	2724	2571	2571
Havre, Montana	(a)	171	144	(a)	7296	8700	8700
Helena, Montana	285	287	171	8062	7989	7834	7898
Houston, Texas	0	0	0	1163	1304	1157	1157
Huron, South Dakota	187	84	0	7623	7807	8004	8004
Indianapolis, Indiana	52	11	0	5282	5394	5298	5298
Jackson, Miss.	0	—	—	2079	—	—	—
Kansas City, Missouri	52	9	0	4779	5227	4956	4956
Kewanee, Illinois	53	12	10	5838	6547	6139	6139
Knoxville, Tennessee	22	1	0	3614	3710	3670	3670
La Crosse, Wisconsin	151	42	0	7314	7408	7322	7322
Lander, Wyoming	303	224	135	8797	8597	7947	7947

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with nine exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Kewanee, Sioux City, and Jackson, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill., Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, and H. M. Ludlow, Box 1368, Jackson, Miss., respectively; Anaconda, Bozeman, Butte and Livingston, Mont., through the courtesy of the Montana Power Company.

(a) Data not available.

[Table concluded on page 93]

Degree-Days for June, 1945 (Concluded)

HEATING AND VENTILATING'S 18TH YEAR OF PUBLICATION OF MONTHLY DEGREE-DAY DATA

CITY	JUNE			CUMULATIVE, SEPTEMBER 1 TO JUNE 30			HEATING SEASON[1]
	1945	1944	NORMAL	1945	1944	NORMAL	NORMAL
Lansing, Michigan	145	54	0	7027	7249	7048	7048
Lewiston, Maine	143	139	45	7626	8199	7707	7707
Lincoln, Nebraska	96	32	0	5630	6152	5999	5999
Little Rock, Arkansas	3	0	0	3049	3138	2811	2811
Livingston, Montana	318	317	142	7450	7136	7185	7205
Los Angeles, California	40	64	0	1552	1471	1504	1504
Louisville, Kentucky	39	3	0	4381	4379	4180	4180
Lynchburg, Virginia	48	1	0	4268	3956	3980	3980
Macon, Georgia	0	0	0	2153	2384	2201	2201
Madison, Wisconsin	141	49	0	7158	7293	7429	7429
Marquette, Michigan	265	187	186	8238	8298	8650	8693*
Memphis, Tennessee	3	0	0	3215	3252	2950	2950
Meridian, Mississippi	0	0	0	2245	2385	2160	2160
Milwaukee, Wisconsin	194	64	39	7086	7318	7245	7245
Minneapolis, Minnesota	158	42	0	7727	7659	7850	7850
Modena, Utah	171	211	42	6576	6901	6562	6562
Montgomery, Alabama	0	0	0	1835	2066	1884	1884
Nantucket, Massachusetts	128	100	123	5606	5830	5957	5957
Nashville, Tennessee	21	1	0	3699	3721	3507	3507
New Haven, Connecticut	92	45	0	5996	6156	5895	5895
New Orleans, Louisiana	0	0	0	987	1234	1024	1024
New York, New York	76	27	0	5028	5391	5347	5347
†Nome, Alaska	1146	960	973	12486	12505	13058	14580**
Norfolk, Virginia	12	0	0	3246	3426	3350	3350
North Head, Washington	337	314	309	4698	4628	5002	5452**
North Platte, Nebraska	149	60	0	6119	6468	6366	6366
Oakland, California	98	158	93	3072	3026	2966	3143**
Oklahoma City, Oklahoma	1	0	0	3444	3667	3613	3613
Omaha, Nebraska	89	35	0	6003	6421	6131	6131
Oswego, New York	157	102	63	6929	7236	7088	7088
Parkersburg, West Virginia	66	18	0	5030	5059	4775	4775
Peoria, Illinois	77	20	0	6062	6288	6109	6109
Philadelphia, Pennsylvania	53	14	0	4631	4856	4855	4855
Phoenix, Arizona	0	0	0	1555	1519	1405	1405
Pittsburgh, Pennsylvania	71	15	0	5217	5383	5235	5235
Pocatello, Idaho	246	239	60	7051	7232	6655	6655
Portland, Maine	172	174	81	7547	7901	7218	7218
Portland, Oregon	117	107	90	4101	4090	4469	4469
Providence, Rhode Island	81	49	0	5481	5832	6015	6015
Pueblo, Colorado	72	29	0	5639	6026	5514	5514
Raleigh, North Carolina	17	0	0	3270	3440	3234	3234
Rapid City, South Dakota	298	173	30	7377	7389	7118	7118
Reading, Pennsylvania	65	16	0	5133	5321	5389	5389
Red Bluff, California	1	—	—	2674	—	—	—
Reno, Nevada	161	241	90	6034	6192	5892	5892
Richmond, Virginia	27	1	0	3729	3932	3695	3695
Rochester, New York	140	66	0	6991	7128	6732	6732
Roseburg, Oregon	115	126	114	4107	4291	4428	4428
Roswell, New Mexico	0	0	0	3308	3644	3484	3484
Sacramento, California	9	46	0	2698	2643	2653	2653
St. Joseph, Missouri	69	21	0	5155	5603	5161	5161
St. Louis, Missouri	42	4	0	4641	4721	4585	4585
Salt Lake City, Utah	185	91	0	5527	6217	5555	5555
San Antonio, Texas	0	0	0	1549	1683	1202	1202
San Diego, California	19	32	6	1511	1392	1645	1645
Sandusky, Ohio	90	20	0	5990	6068	6208	6208
San Francisco, California	147	218	195	2774	2672	2876	3264**
Sault Ste. Marie, Michigan	254	209	189	9013	8951	9139	9285**
Savannah, Georgia	0	0	0	1480	1531	1490	1490
Scranton, Pennsylvania	113	34	0	6234	6363	6129	6129
Seattle, Washington	156	149	162	4201	4250	4857	4934**
Sheridan, Wyoming	266	207	120	7530	7392	8008	8008
Shreveport, Louisiana	0	0	0	2097	2243	1938	1938
Sioux City, Iowa	126	53	0	6794	7063	6898	6898
Spokane, Washington	166	104	81	6168	6259	6355	6355
Springfield, Illinois	62	9	0	5719	5467	5373	5373
Springfield, Missouri	43	11	0	4683	4850	4428	4428
Syracuse, New York	129	65	12	6877	7202	6893	6893
Tacoma, Washington	186	182	183	4642	4739	5066	5181**
Terre Haute, Indiana	48	10	0	5073	5228	4872	4872
Toledo, Ohio	101	34	0	6586	6645	6077	6077
Topeka, Kansas	50	10	0	4767	5193	4969	4969
Trenton, New Jersey	71	17	0	5061	5344	4933	4933
Utica, New York	131	73	0	7301	7647	6796	6796
Valentine, Nebraska	212	113	0	7182	7383	7039	7039
Walla Walla, Washington	71	62	0	4707	5055	4808	4808
Washington, D. C.	30	4	0	4287	4460	4626	4626
Wichita, Kansas	25	2	0	4527	4786	4673	4673
Williston, North Dakota	263	155	54	8751	8205	9323	9323
Winnemucca, Nevada	172	219	117	6386	6555	6391	6427**
Yakima, Washington	64	—	0	5169	5385	5599	5599

†Nome data are for April.
(a) Data not available.

*Includes August.
**Includes July and August.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

CANADIAN DEGREE-DAYS*

For a normal season and for the heating season September 1, 1944 to May 31, 1945

Station	Season	Month									
		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
		Number of Degree-Days									
Calgary, Alta.	1944-45	252	477	1098	1302	1426	1305	1057	1029	567	8513
	Normal	432	722	1122	1426	1609	1355	1215	750	480	9111
Charlottetown, P. E. I.	1944-45	152	558	750	1265	1355	1246	1091	762	583	7762
	Normal	222	539	858	1246	1463	1338	1203	858	536	8263
Crescent Valley, B. C.	1944-45	267	508	888	1215	1116	997	933	717	322	6963
	Normal	360	698	981	1240	1352	1112	961	624	403	7731
Edmonton, Alta.	1944-45	357	586	1251	1516	1686	1436	1147	987	477	9443
	Normal	417	747	1209	1609	1832	1501	1293	738	428	9774
Fort William, Ont.	1944-45	325	663	951	1600	1934	1512	1079	936	682	9682
	Normal	354	722	1143	1596	1807	1582	1386	888	567	10045
Grande Prairie, Alta.	1944-45	375	611	1320	1565	1717	1481	1227	1008	465	9769
	Normal	480	812	1218	1649	1841	1456	1339	822	505	10122
Halifax, N. S.	1944-45	130	474	681	1070	1178	1095	927	642	572	6769
	Normal	198	499	789	1147	1308	1198	1073	768	496	7476
London, Ont.	1944-45	172	519	798	1376	1624	1190	701	564	515	7459
	Normal	126	508	843	1200	1336	1240	1073	642	307	7275
Medicine Hat, Alta.	1944-45	238	428	1263	1466	1550	1394	1011	846	453	8649
	Normal	267	601	1104	1417	1643	1406	1150	606	301	8495
Moncton, N. B.	1944-45	200	620	822	1392	1494	1310	1097	684	570	8189
	Normal	282	595	936	1373	1528	1392	1190	798	474	8568
Montreal, P. Q.	1944-45	198	558	879	1590	1841	1305	874	522	403	8170
	Normal	180	561	948	1407	1587	1392	1209	702	298	8284
North Bay, Ont.	1944-45	300	676	1005	1587	1987	1389	967	735	570	9216
	Normal	264	694	1017	1528	1658	1492	1280	813	434	9180
Ottawa, Ont.	1944-45	215	595	900	1612	1894	1338	877	546	471	8448
	Normal	204	595	984	1494	1646	1459	1256	726	310	8674
Penticton, B. C.	1944-45	168	441	792	1122	1023	865	790	588	260	6049
	Normal	213	527	813	1073	1184	969	787	507	273	6346
Porquis Junction, Ont.	1944-45	371	806	1146	1730	2251	1557	1091	894	698	10544
	Normal	396	800	1266	1786	2052	1764	1550	972	558	11144
Prince George, B. C.	1944-45	405	660	1011	1590	1414	1193	1042	894	440	8649
	Normal	444	741	1068	1504	1615	1305	1091	738	490	8996
Quebec City, P. Q.	1944-45	186	629	870	1550	1755	1302	1011	612	465	8380
	Normal	276	651	1050	1534	1696	1481	1311	849	428	9276
Regina, Sask.	1944-45	315	582	1278	1680	1820	1641	1147	945	604	10013
	Normal	408	794	1355	1779	2037	1764	1504	816	434	10891
St. John, N. B.	1944-45	191	555	792	1276	1432	1190	958	678	546	7618
	Normal	270	558	870	1271	1417	1266	1132	792	505	8081
Saskatoon, Sask.	1944-45	292	574	1320	1668	1879	1641	1135	1038	598	10145
	Normal	396	781	1305	1767	2027	1635	1443	725	397	10478
Toronto, Ont.	1944-45	142	483	756	1210	1549	1093	691	545	468	6937
	Normal	169	506	821	1155	1302	1211	1078	675	344	7261
Vancouver, B. C.	1944-45	272	403	588	865	760	669	701	564	279	5101
	Normal	234	459	657	818	893	736	682	498	326	5303
Victoria, B. C.	1944-45	190	301	549	735	685	605	648	546	291	4550
	Normal	264	446	462	738	815	689	651	504	366	4935
Windsor, Ont.	1944-45	106	312	705	1277	1507	1081	601	468	440	6497
	Normal	54	425	795	1172	1283	1148	995	582	251	6705
Winnipeg, Man.	1944-45	294	860	1116	1705	1894	1610	1104	978	626	9987
	Normal	330	744	1302	1829	2111	1775	1531	822	397	10841

*These data are by the Meteorological Division, Air Services Branch, Department of Transport, Canada.

New Developments in Washington

We'll Send Coal to Europe; No Open Market for Sheet Steel; Freed Oil Burners Back Under WPB Wing; Worst Fuel Oil Shortage

LORING F. OVERMAN

AS this column goes to press with its monthly summary of Washington happenings of interest to the heating, ventilating and air-conditioning industries, it is a bit difficult to determine which of half a dozen major developments is of greatest significance. Hence the following listing, with the suggestion that the reader take his choice:

(a) OPA's Reconversion Pricing Formula.
(b) WPB's Priorities Regulation 29—providing a six-month transition period pointing toward removal of all but military priority ratings.
(c) PAW's decision to export 6,000,000 tons of coal to Europe.
(d) CMP's partial closing of its July 1 open-ending.
(e) The Pacific War demand for petroleum products.

Coal for Europe

As evidence that any one of the foregoing listings is as important as another, selecting for discussion one out of the middle of the group reveals the need for brakes on any planning that involves increased or initial use of coal during the 1945-46 season.

The decision to ship approximately 6,000,000 tons of American coal to devastated countries of Europe between now and January 1 "involves the risk that next winter's shortage of coal here will be more acute than heretofore predicted, and substantially greater than that experienced last year." The quotes are from the loquacious Harold Ickes, Solid Fuels Administrator for War, who goes on to explain that the decision has been made with the greatest reluctance, but with the conviction that the results will be worth the risk.

"The race in Europe today is one between coal and anarchy," explains SFA Ickes. "I do not think it is going too far to say that a coal famine of such severity as to destroy nearly all semblance of law and order is certain to occur in certain countries in Northwest Europe next winter unless immediate and drastic action is taken now. Shipments to Europe should prevent disorders which would cost American lives, and they should enable the European countries to resume the production of food, textiles and other materials which we would otherwise have to supply from our own depleted stocks.

"We may have to curtail industrial supplies to the point which will mean a partial or complete shutdown of some plants. We may even have to reduce the 80% quota which we have fixed for domestic consumption.

Army Aid Asked

"The only sure way to avoid further distress at home, as well as disaster in Europe, is to increase production. To increase production we must have more coal miners, and the only sources of additional miners is the Army. As Solid Fuels Administrator I have appealed to the Army to release miners in sufficient numbers to increase our own output of coal and thus provide for at least minimum needs here at home. I understand that this plea is now under consideration. It is estimated there are 130,000 miners in the Army, necessarily our youngest, strongest and most proficient miners. We have asked the Army to release at least 30,000. It is largely on the basis of my belief that the Army will accede to this request that I have decided that we should begin to ship coal to Europe at once."

Coal vs Cork

That the Solid Fuels Administration isn't kidding when it reports it has been reluctant to tap America's dwindling coal piles for export to Europe is indicated by a Washington rumor that another shortage of cork was narrowly averted recently. It appears that Portugal had applied for some 60,000 tons of American coal, and that the request was scheduled for denial. Whereupon, Portugal reminded Washington that it might have to seek other markets for its cork—of which it produces 80% of the world's supply. WPB, in turn, put on the pressure when it started figuring what would happen to insulation programs, gasket construction and a thousand and one other processes if Portugal was lost as a source of cork.

So there's probably more than meets the eye in the current decision to ship six million tons of badly needed American coal to Europe. SFA Ickes' public appeal is made entirely on a humanitarian basis—doubtless reason enough for approving the decision.

For all those interested in coal, however, it might be a good idea to waylay the nearest vacation Congressman or Senator and urge that he lend his support to SFA Ickes' request that the Army release enough miners to take up the slack.

Concludes SFA Ickes:

"I do not want the life of any American soldier in our army of occupation endangered by the frenzied efforts of the people of Europe to keep from freezing this winter. Nor do I want it ever to be said that Americans loved their comforts so much that they did not lift a finger to shield the brave men and women of the devastated countries of our allies from the marrow-chilling ordeal that faces them this winter. We cannot expect a friendly handshake from hands swollen with chilblains."

Closing the Open-End

Inasmuch as even industrial plants using coal may have to tighten their belts next winter, it might be timely to consider paragraph (d) at the beginning of this column—CMP's partial closing of open-ending provisions placed in effect July 1. On that date producers of civilian items were told to step into the open market and purchase steel, copper and aluminum without priority ratings or other restrictions—except that war needs must be supplied first. As far as copper and aluminum are concerned, the open-ending appears to have produced the sought-after materials. As for steel—particularly sheet and strip—nothing happened.

It now develops that screened requirements for the third quarter of 1945 exceed the total capacity of the sheet mills, and that there is a 650,000-ton carry-over of war-connected orders from the second quarter that must be filled ahead of deliveries for the third quarter. WPB appears convinced there will be no open mill space for deferred or unrated orders during the third quarter if these preliminary indications are confirmed.

This simply means that any reconversion to civilian heating or air-conditioning production would appear to be stymied until deep into the fourth quarter, unless such production is already on an authorized WPB program for which metals allocations have been made. WPB is still taking steps to find out why sheet steel prospects on paper are so much greater than actual

metal available for civilian use. The steps include review of authorized construction programs, freezing of the order files of steel mills and scheduling some orders for small business ahead of certain rated orders, and shortening to 45 days the permitted inventory of sheet and strip steel in processor's hands.

Transition Ratings

WPB's action in scheduling certain small-business needs ahead of rated orders during the current spot shortage of sheet and strip steel is significant in more ways than one. It has the effect of giving special unannounced ratings to some civilian production and actually means operating on an even stricter allocation plan than was in force before CMP was open-ended. This leads right into consideration of how such a prospect might affect paragraph (b) of our initial listing—WPB's Priorities Regulation 29.

Priorities Regulation 29 outlines a six-months transition program intended to give business an opportunity to get used to working without priority ratings. The plan points toward operation during 1946 with a single MM rating band for military production, and an AAA band for civilian emergencies. Beginning October 1, WPB will discontinue assigning the present AA ratings except for deliveries through December. Before October 1, outstanding AA ratings calling for 1946 deliveries will be cancelled.

CMP, and all regulations connected with allotment controls, will expire automatically December 31, except certain inventory restrictions. Deliveries of CMP materials during the third and fourth quarters will continue under CMP. For the remainder of the year, WPB will see to maintaining civilian production at programmed levels, but will not stand in the way of any manufacturer going beyond established quotas if he can secure necessary materials and components without priorities assistance.

It is this "if he can secure without priorities assistance" that is blocking many a civilian reconversion program, and the current crisis in sheet and strip steel indicates that some of the announced reconversion measures have been premature. WPB takes the position, however, that it will be criticized less for being ahead of the game. Too, the inside opinion continues that it will not take much longer for certain military cutbacks to really show up in surplus materials, and that when this happens the problems of shortage will do a quick reverse.

Those Oil Burners

Among numerous examples of WPB's hounds overrunning the hare is the recent revocation of all restrictions on the production and distribution of oil burners. In freeing oil burners, WPB overlooked the fact that OPA and PAW have fuel-conservation restrictions against such installations. As a result, on July 11, WPB reenacted its distribution and installation controls to bring its order back into line.

More thoughtful was the recent amendment of Order L-176 to permit unrestricted production of electric fans. Distribution controls remained. Marine fans for shipboard use by the armed forces, and deliveries to other manufacturers are allowed without special authorization. Hospitals, institutions and essential industrials will continue to apply on form WPB-1319.

Pacific War Demands

Mention that WPB was required to retrace its steps as a result of the petroleum situation leads us to consideration of paragraph (f) of the six-point listing—Pacific war demands for petroleum products.

Warning that the Pacific war will take 8,400,000 more gallons of petroleum products daily at its peak than is being used today, the Petroleum Administration for War has taken two steps toward solution. First, the oil production rate certified for August is 5,240,000 barrels daily—16,900 barrels daily above July's all-time record of 5,223,100 barrels daily. As its second move, the PAW on July 20 authorized fuel conservation directors of 25 states to launch local drives immediately to prepare home owners and building operators for "the worst fuel shortage of the war."

"With the shift of concentrated military activities from the European theater, the character of petroleum war requirements has changed," explained Deputy Petroleum Administrator Ralph K. Davies. "The war against Germany called for all-out gasoline production. The emphasis in the war against Japan has turned to fuel oil. The war in Europe was primarily land warfare. The Pacific war is amphibious. It also involves movement of men and supplies over greatly extended distances.

"Thus the quantities of fuel oil needed now are greater than those required when principal military operations centered in Europe."

The 25-state campaign urges summer storage of oil and coal, and a drive to make every building heat-tight by insulation, storm doors and windows, weather-stripping, caulking and other means, a checking of the efficiency of all heating equipment.

"Millions of Americans in the eastern half of the nation will have to keep warm on 80% or less of the coal or coke normally burned, while fuel oil users cannot expect more than three gallons for every four normally consumed," the warning states.

Reconversion Pricing

While continuing shortages make it apparent that many of the changes expected to follow VE-day must now await VJ-day, it is still reassuring to find WPB's plans for reconversion matched by OPA's schedule for pricing resumed production as soon as it appears. With the announcement on July 20 of three reconversion pricing orders, the way is now cleared for a back-to-civilian-production drive in due time. Official Washington isn't again sticking its neck out to forecast when that time will be, for it well remembers red faces that followed the upsetting of last year's prediction of a pre-Christmas VE-day. There are many in Washington, however, who "just don't see how the little Nips continue to hold out." As a result, the military continue to plan for the worst, while civilian Washington hopes for an early conclusion of Pacific war activities.

There are also many who say that the possibility of an early surrender must not be discounted in reconversion planning. The new pricing regulations are steps that have been taken to anticipate such a possibility, and at the same time to keep national exuberance following such an event from resulting in disastrous inflation.

For some time the question of pricing has been one of secondary concern to the planners of heating, ventilating and air-conditioning installations, for the cost-plus principle has made the subject far less important than the delivery date. With the return of business-hungry competition, it will again become the duty of the planner to be as familiar with price and comparative value as with specifications.

Three Groups Priced

The three new pricing orders divide manufacturers into three classes—those with annual sales of more than $200,000 (excluding war contracts); those with sales between $50,000 and $200,000; and those with total sales less than $50,000. Any manufacturer who desires to do so may resume production at the prices he charged in 1942 without consulting OPA.

Other Orders Coming

Price policies announced July 20 apply only to manufacturers. Those applying to wholesalers, retailers and new manufacturers will be ready for release soon.

What the Ventilating Engineer Should Know About

Lead Azide Hazards

THE increased use of lead azide as a detonator in shells and the enormous expansion of the explosives industry in the war effort has stimulated interest among industrial hygienists with reference to possible harmful effects of exposure to lead azide or its intermediates in the process of manufacture. Apparently no investigation of the toxicity of lead azide itself has been made, although some investigation of hydrazoic acid has been reported.

Lead azide is a white crystalline substance having the formula $Pb(N_3)_2$. It is very explosive, decomposes when warmed, and is sensitive to light. When exposed to sunlight it becomes covered with a dark brown film. Lead azide may be prepared by precipitation from an aqueous lead salt solution with hydrazoic acid or by a solution of a soluble azide. It is prepared commercially by precipitation from a solution of a soluble lead salt such as lead nitrate by the addition of a solution of sodium azide. A small quantity of dextrine is added to the solution in order to control crystal shape. If dextrine is not used, the lead azide crystals are needle-shaped, which not only are very sensitive but do not run freely in the charging machines at the later stages of manufacture. Sodium azide is prepared by the action of nitrous oxide on sodamide, $NaNH_2$. A basic lead azide can be prepared which is less sensitive to percussion or temperature than lead azide itself. When mixed with 30% water, lead azide is said to have the same sensitiveness as the dry material. According to Riegel lead azide is about half as sensitive as mercury fulminate. It is said to have several advantages over mercury fulminate, $Hg(ONC)_2$, however. According to Stuart it possesses a very considerably higher ignition point and is completely and permanently stable when exposed to temperatures of about 50C. According to the same authority it is unaffected by other metals, shows a great superiority as an initiator of detonation, retains its brisance unimpaired under heavy pressure, and does not exhibit the phenomenon of becoming "dead pressed."

Hydrazoic acid, or azoimide, HN_3, in aqueous solution behaves as a strong acid dissolving such metals as zinc, iron, or magnesium with the evolution of hydrogen and the formation of the corresponding metallic salt. The acid solution has a penetrating, unpleasant odor, causes headache and eye irritation, and consequently requires care in handling.

Lead azide is coarsely crystalline in form and, owing to its explosive character, dust arising from it is kept to a minimum in industry. Exposure to the substance by inhalation in industry is consequently negligible. However, the possibility of inhalation of a certain amount of azoimide vapor occurs in the preparation of the lead compound and furthermore there is the possibility of other exposure to either the lead salt or more soluble azides in the course of preparation. For these reasons it is advisable to define more clearly the toxic factors associated with the industrial production of lead azide.

An investigation of lead azide as an industrial hazard by the U. S. Public Health Service and published in Public Health Reports, has indicated that the storage and distribution of lead in the tissues following the ingestion of this compound are in general similar to that of other lead salts. The acute toxic effect of this substance, however, is associated with the azoimide radical rather than with the lead.

Further evidence confirming this was obtained from observations of the effect of administering sodium azide intraperitoneally, subcutaneously, and orally in comparison with similar experiments with lead azide. The minimum lethal dose of sodium azide following injection lies between 35 and 38 mg per kg of body weight, while up to 150 mg per kg of body weight of lead azide could be injected intraperitoneally without causing death. This is equivalent in amount to 66 mg of sodium azide.

The effect of exposure to hydrazoic acid gas by inhalation was determined at various concentrations and it has been shown to be invariably fatal to rats in amounts beyond 1160 ppm when breathed for 1 hour. The results of this investigation indicate clearly that hydrazoic acid should be considered a dangerous gas.

Koreans Have Floor Heating

A great many references are made to the fact that radiant heating is found in ancient Roman ruins in England. There is a possibility, however, that the underfloor hot air flues used by the Romans were also used by other races in the distant past. Korea, for instance, has a civilization that goes back 2000 years, the last forty of which have been under Japanese domination; Koreans have had floor radiant heating for many years. The floor heating consists of hot air flues beneath the floors.

Abstracts AND Reviews

Articles are abstracted for the convenience of the readers. Orders cannot be taken for the full length articles. Those desiring to obtain copies of the article referred to should write to the publishers of the respective articles.

ADSORPTION

To increase the effectiveness of air conditioning systems, it is necessary to recirculate some of the air. On the other hand, air that is reused carries with it an assortment of objectionable odors which it is well to remove by adsorption media or commercial adsorbents.

Adsorbents are also used for the recovery of solvents, dehumidification and the drying of gases. All this is covered in "Adsorption," by C. L. Mantell, consulting chemical engineer.

Although there is a brief chapter on the theories of adsorption, the book is chiefly concerned with the practical and commercial side of the subject. The subject matter is well arranged and is interestingly presented. Some of the 18 chapter heads are:

Fuller's Earth and Activated Clays; Aluminum Oxide Base Materials; Bone Char and Related Materials; Gas-adsorbent Carbons; Silica Gel; Magnesia and Hydrous Oxides; Solvent Recovery and Adsorption from Gases; Odor Removal; Dehydration of Air and Gases; Inspection, Specification and Testing of Adsorbents.

Adsorption by C. L. Mantell. Cloth bound, 5¼x8¼ in., 386 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $4.50.

PROPERTIES OF AIR

Under the title "Thermodynamic Properties of Air," Professors Joseph H. Keenan and Joseph Kaye, professor and assistant professor, respectively, of mechanical engineering at the Massachusetts Institute of Technology, have prepared a book on this subject, the need for which has been emphasized recently by the growing interest in the gas turbine.

The principal table in the volume is Table 1 entitled "Air at Low Pressures," which covers the range in one degree steps from a temperature of —159.7F to 2539.3F and in 10 degree steps from 2540.3F to 1318.9F. The table includes data on absolute temperatures, enthalpy, relative pressure, internal energy, relative volume and entropy. Other tables include values for various constants, conversion factors and similar information, followed by an 11-page section on examples and use of the tables.

Cloth bound, 7½x10¼ in., 73 pages. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price, $2.25.

PIPING HANDBOOK

The fourth edition of the "Piping Handbook" has appeared under the authorship of Sabin Crocker, of The Detroit Edison Co. This book, which formerly appeared under the authorship of Mr. Crocker and J. H. Walker of the same company, has been extended to include chapters on gas piping, refrigeration piping, hydraulic power transmission piping, and corrosion; the last also covers the subject of protective coating.

In addition, the chapter on "Water-Supply Piping" has been considerably augmented, and supplementary material of interest to hydraulic engineers has been added in the section on "Flow of Water in Pipes," which now includes the Scobey, Williams-Hazen, and Kutter-Manning formulas.

In making these extensions, the author has been assisted and counseled in the respective fields by outstanding experts.

According to the preface, Mr. Walker was unable to participate fully in the work on this edition so that his name no longer appears as co-author, although he was able to take part in revamping the chapters on Heat Insulation, Building Heating Systems, and Underground Steam Piping.

In addition to the chapters mentioned in the foregoing, the following chapters are included: Definitions, Formulas, and Tables; Properties of Fluids; Metallurgy of Piping Materials; Pipe, Valves, and Fittings; Hangers and Supports; Expansion and Flexibility; Steam Power-Plant Piping; Plumbing Systems; and Oil Piping.

Cloth bound, 4⅝x7¼ in., 1376 pages. Published by McGraw-Hill Co., 330 W. 42nd St., New York 18, N. Y Price, $7.

IN BRIEF

APPROVED ASA STANDARDS—A new list of all American standards and war standards approved to date has just been published for free distribution. About 800 standards are listed alphabetically as well as by engineering fields. War standards are listed separately. Standards are constantly revised to keep up with advances in industrial methods and materials. Obtainable from American Standards Assn., 70 E. 45th St., New York 17, N. Y.

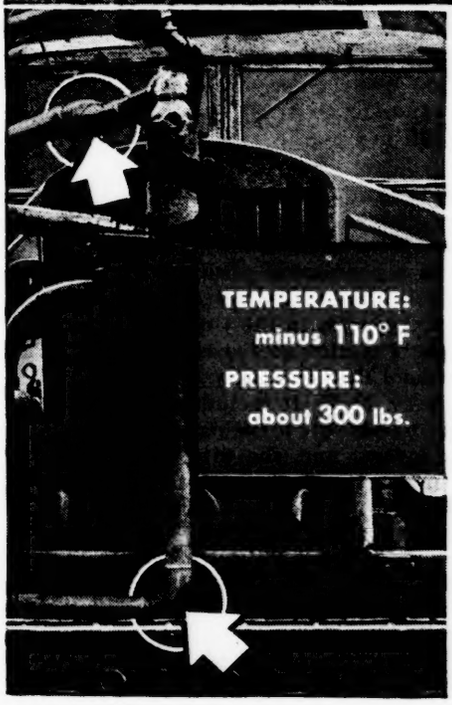
NEW YORK MARKETS—An excellent, elaborate and complete market analysis of the four boroughs of New York City served by Consolidated Edison, has been made and published by Consolidated Edison Company of New York, Inc., in a 124-page book of data with four maps, one for each of the boroughs, included in a flap in the back. The book measures 12¼ x 18½ in. in page size and includes every conceivable set of market data pertinent to applications of electric and gas equipment. Among the data is information on plumbing and heating wholesalers, residential structures and equipment including the fuel used for heating, and allied subjects, each tabulated for the four boroughs separately.

WAGE CHART.—The 1945 National Wage Chart showing hourly wage rates paid building mechanics in 28 different classifications in 137 United States and Canadian cities is available from the Builders Association, 228 N. La Salle St., Chicago 1, Ill. The chart, which measures 23 x 20½ in., is widely used by general contractors, sub-contractors, architects, engineers and others throughout the country. It has been issued by the Association since 1902. Price, $1.50.

WAR PRODUCTION IN 1944—Report of the Chairman of the War Production Board in which is presented how facilities, materials, components and manpower were obtained. There are also chapters on controlling the flow of resources and production, civilian requirements and reconversion planning. Paper covered report contains 142 pages. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 25 cents.

"SNOW"

fights airplane fires



WHEN this Cardox Airport Fire Truck roars up and releases a mass discharge of *tons* of carbon dioxide "snow" (dry ice) and carbon dioxide vapor at minus 110° F., at pressure of about 300 pounds per square inch — plus hundreds of gallons of fire-blanketing foam—crash fires usually die fast.

Such service calls for the extra strength and reliability of Tube-Turn welding fittings. Their smooth interiors make for maximum efficiency of flow, help in assuring fast, dependable action.

Many equipment manufacturers are discovering what piping engineers have long known—that Tube-Turn welding fittings offer exclusive advantages in any use where piping efficiency is a factor. Tube Turns engineers will be glad to consider your individual problem, without obligation.

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Selected Tube Turns Distributors in every principal city are ready to serve you from complete stocks.

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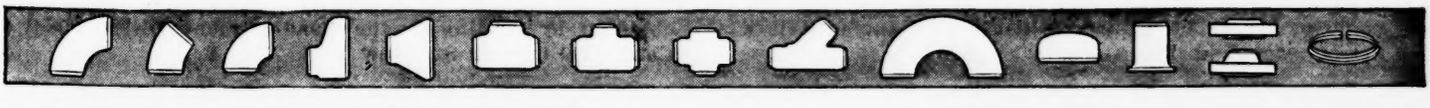
Welding Fittings and Flanges



HEATING THE HOME—In a free non-technical 12-page bulletin "Heating the Home," the Small Homes Council of the University of Illinois has made available information for those interested in homes. It illustrates and discusses gravity warm air, forced warm air, gravity hot water, forced hot water, one pipe steam, two pipe steam and panel heating. Another free bulletin issued by the council is on "Solar Orientation." It calls attention to the advantage of facing as many rooms as possible to the south. Small Homes Council, University of Illinois, Urbana, Ill.

FUEL ECONOMIES—A panel discussion on "Fuel Economics Affecting Power Plant Design," was presented at meetings sponsored by four major equipment companies and at a meeting of the steam power and fuels division of the American Society of Mechanical Engineers. The panel discussion consisting of three papers is now available in booklet form. Available from Fairmont Coal Bureau, 122 E. 42nd St., New York 17, N. Y.

INTRODUCTION TO ELECTRONICS — To provide an understanding of the principles of electronics and an idea of the part electronics will play in future industrial developments, a 20-page book entitled "Introduction to Electronics" has been prepared by Dr. Walther Richter.

A brief discussion on the fundamentals of conversion and control of electric power in a load prefaces introduction of the subject of electron tubes. Approaching this subject as a guide for application engineers, instead of tube designers, the book explains that the electron tube is a new control element which is nothing but a special type of rheostat or switch. The discussion of tubes is divided into two main parts: vacuum and gaseous. Line drawings, curves, and sketches add materially to comprehension. This booklet, E-6358, is available from Allis-Chalmers Mfg. Co., 568, Milwaukee 1, Wis.

VAPOR BARRIERS.—A 34-page multigraphed, standard size research report entitled, "Vapor Barriers," published by the Office of Production Research and Development, War Production Board, Washington, D. C. The laboratory work for the report was done by the University of Michigan. Work was coordinated by the Industrial and Consumer Products Branch of the War Production Board, and the author is J. Louis York, instructor in chemical and metallurgical engineering at the University of Michigan. Booklet is divided into three parts: (1) A discussion of the subject including a table of the water vapor transmission rates for various building materials; (2) a history and outline of methods of measuring vapor transmission; and (3), the main part of the report, an annotated bibliography.

PIPE, DUCTS AND FITTINGS — The National Bureau of Standard has published Simplified Practice Recommendation R207-45 for Pipes, Ducts, and Fittings for Warm-Air Heating and Air Conditioning. The recommendations comprise a list of sizes of pipes, ducts and fittings for regular stock purposes. This stock list was evolved after considerable study by the simplification committee. Included is a list of manufacturers, distributors and users who have accepted and have approved the recommended practice. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 10 cents.

ANTHRACITE.—A standard size, multilithed, 26 page booklet entitled "The Physical and Chemical Properties of Pennsylvania Anthracite," published by The Anthracite Industries, Inc., 101 Park Ave., New York 17, N. Y. The book is a compilation of data from a wide range of sources and includes such widely varying information as analyses of anthracites from various fields to the angle of repose of anthracite ash. Also included is a list of terms and definitions.

REFRIGERANT CONTROL.—More than 10,000 copies of Handbook of Automatic Refrigerant Control are being used by the Army and Navy men and maritime personnel. This 68-page pocket size book emphasizes the control of refrigerant in the system. Text, with the least amount of technical expressions is used. While not intended as a substitute for some of the technical books now being used, it was brought out to supply information on a specific and important subject. This book practically out of circulation for three years, again available from Alco Valve Co., St. Louis, Mo. Price 50 cents.

WARTIME DEVELOPMENTS—To excite the imagination of the manufacturer and particularly the manufacturer who has marked time during the war, the government has issued a 400-page book, "Wartime Technological Developments." Nearly 1500 brief reports are given, taken from trade publications, to show new thoughts in manufacturing procedure and shorter or better methods for producing things. Copies available from the Superintendent of Public Documents, Government Printing Office, Washington 25, D. C. Price, 50 cents.

VISCOSITY OF GASES—A 68-page bulletin No. 354 of the University of Illinois Experiment Station, Urbana, Ill., entitled "The Viscosity of Gases at High Pressures", by Edward W. Comings, Bertrand J. Mayland and Richard S. Egly, covering results of a study of the effect of pressures on the viscosity of gases. Measurements were made on carbon dioxide, ethylene, propane, and methane. The 68-page booklet is paper bound, 6x9 in. in size. Price 75c, with a limited supply of copies available for free distribution.

HOOP STRESSES IN FAN ROTORS—A simple method of determining to a fairly close approximation the hoop stresses in rotors containing a central hole is given in a paper "A Simplified Method of Determining Hoop Stresses in Fan Rotors," by G. F. Lake of Durham, England, presented at the annual meeting of the American Society of Mechanical Engineers, November, 1944. For a disk of varying thickness, the old method is to break it up into one or more sections of soluble shape. The author claims that by applying his method to cases capable of solution, the likely error by the approximate method is an over-estimate of about 5% in the maximum hoop stress. Paper published by the American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y.

MARKETING RESEARCH AGENCIES—The names and addresses of marketing research agencies in 14 cities of the United States with a population of over 500,000 are contained in the 1945 edition of Survey and Directory of Marketing Research Agencies in the United States. It was prepared under the direction of Ernest S. Bradford, Director, Bureau of School Research, City College School of Business, New York 10, N. Y. It includes data on the date of organization, names of principal officers, the number of office employees, and the size of the field staff. This small 34-page paper-bound book will be of definite value to those concerned with market research and its possibilities. Price, $3.

ESTABLISHING BEACHHEADS OF PUBLIC OPINION.—An 8-page booklet containing reproductions of newspaper articles on plumbing and heating in the post-war period. Published by the Plumbing and Heating Industries Bureau, 35 East Wacker Dr., Chicago 1, Ill.

SETTLEMENT OF ARMY-NAVY CONTRACTS—The War and Navy Departments combined to issue the Army-Navy Contractors' Guide for Prime and Subcontractors. Among the many things covered in this 59-page booklet is the settlement of terminated fixed-price supply contracts with the Army and Navy. Free copies may be obtained by writing to the Readjustment Distribution Center, 90 Church St., New York 7, N. Y.

1—IS IT ALL METAL?

All-metal filters are effective in preventing passage of fire in the ducts, and resist deterioration.

2—IS THE FILTER CLEANABLE?

Cleanable filters cost more to buy, but are much cheaper in the long run. They can pay for themselves in a year or two.

3—IS IT CONSTRUCTED TO RESIST VIBRATION?

The filter media should be of fixed density throughout. It must not shake down, leaving open spaces that will pass unfiltered air.

4—HAS IT AMPLE DIRT-HOLDING CAPACITY?

Filters that collect dirt on the surface only, need attention much oftener than filters providing a depth of dirt penetration. The latter hold more dirt, and still permit passage of air without undue restriction.

5—WHAT WILL BE THE INTERVAL BETWEEN SERVICING?

Man-hours are precious. Be sure you have enough filter area to provide the maximum operating period before filters need cleaning. To accomplish this, try to keep air velocity at face of filters around 300 feet per minute.

6—IS IT BEST SUITED TO MY PARTICULAR APPLICATION?

Every ventilating job is tailored to your need by your ventilating engineer. He knows that important factors such as size of particles to be collected, initial resistance, over-all efficiency, as well as cost, must be carefully considered for each application. Reliance on his judgment will save you money and assure permanent satisfaction with your air filters

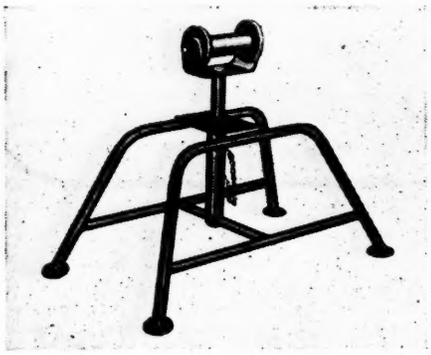
• • •

You get engineered filtration in every Air-Maze Filter. Whether your interest in filters applies to air conditioning, ventilating, compressors, blowers or engines, remember—"If it uses air—use Air-Maze". Air-Maze Corporation, Cleveland 5, Ohio. Representatives in principal cities. In Canada: Williams & Wilson, Ltd., Montreal, Quebec, Toronto, Windsor; Fleck Bros., Ltd., Vancouver.

NEWS OF EQUIPMENT AND MATERIALS

Pipe Conveyor

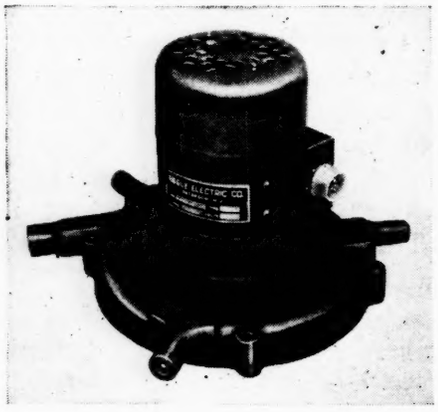
NAME—Herculean roller conveyor.
PURPOSE—For conveying pipe, tubes, rods and bars.
FEATURES—Can be used as a single unit or in line, tandem fashion, for transferring material from box cars to warehouse, from bins to threading machines, trucks, etc. Has adjustable swivel center post which raises roller to an overall height of 51 in.; Minimum height is 31½ in.



SIZES AND CAPACITIES—Weight capacity 1000 lb., handles up to 12 in. pipe. Weight of unit is 81 lb.
MADE BY—*John Moore Specialty Co., 6130 North Hiawatha Ave., Chicago 30, Ill.*

Lightweight Fan Motor

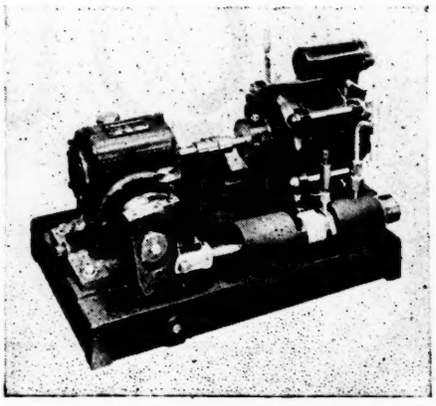
NAME—Bogue ultra lightweight fan motor.
PURPOSE—For use with high capacity blowers.
FEATURES—Although designed for 24-volt operation on d-c, can be adapted for any specified voltage. It delivers



2 hp. Motor is quiet and self-ventilated. Windings are designed to match fan characteristics and speeds of 5,000 rpm or higher are recommended. By mounting motor directly on the blower housing, one end shield is eliminated.
MADE BY—*Bogue Electric Co., 40 Kentucky Ave., Paterson 3, N. J.*

High Pressure Pump

NAME—Precision—U.O.P. high speed duplex pump.
PURPOSE—For continuous, high-pressure pumping.
FEATURES—Developed in collaboration



with the Universal Oil Products Co., this pump features sturdy construction and an adjustable stroke for continuous, high-pressure operation. The pump is of the duplex type permitting two different liquids to be pumped at once; or, for increased capacity, both cylinders can be used in parallel. Volumetric efficiency is said to be over 90%.
MADE BY — *Precision Scientific Co., 1754 N. Springfield Ave., Chicago 47.*

200 Amp. Welder

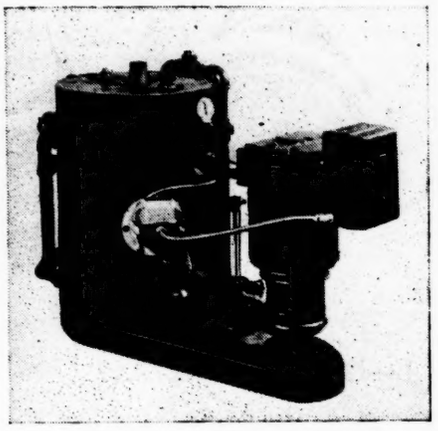
NAME—200 ampere Wilson Bumblebee transformer welder.
PURPOSE—For welding where an a.c. machine of medium capacity is desired. Built-in capacitators said to make possible power economies up to 35%, reduce power bills and power input, and relieve overloaded transmission and plant feeder lines, leaving current for additional equipment. Unit is equipped with disconnect switch. Self-contained, unit has two ranges by turning crank on top of machine.
LITERATURE AVAILABLE — Illustrated leaflet.
MADE BY—*Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.*

Diaphragm Cloth

NAME—Diaphragm cloth.
PURPOSE—For use in fuel pumps.
FEATURES—Especially processed cotton cloth. Said to have excellent bursting and tearing strength, to remain flexible and offering almost instantaneous recovery over a wide range of operating temperatures. Samples will be sent on request.
MADE BY—*Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington 11, N. J.*

Vacuum Process Pump

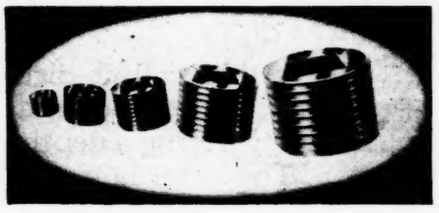
NAME—Whittington vacuum process pump.
PURPOSE—Vacuum pump operating on the water jet principle.
FEATURES—There is only one moving part, the bronze impeller of the conventional centrifugal pump. Abrasive dust or foreign matter in the air stream does not impair the pump because it does not go through the



pump. It is not affected by moisture in the air stream. Neither tail water pump nor barometric column is required. Makers guarantee a vacuum of 28 in. of mercury with 70F recirculating water. If cooler water is available, a higher vacuum may be developed to within 0.6 in. of barometer.
MADE BY — *Whittington Pump & Engineering Co., 225 S. Meridian St., Indianapolis 4, Ind.*

Plastic Pipe Seals

NAME—Plastic pipe seals and thread protectors.



PURPOSE—To seal off pipe ends and protect pipe threads.
FEATURES—Pipe seals feature a countersunk head of dimensions to fit commercial square bars of standard sizes. Strength and lightness of plastic together with its dielectric strength and non-corrosive ability to take and hold a thread said to make it an efficient guard against oil, dirt, moisture, grit, etc.
SIZES—⅛, ¼, ⅜, ½, ¾, and 1 in.
MADE BY—*American Molded Products Co., 1644 N. Honore St., Chicago 22, Ill.*

REVERE Copper Tube not only provides enduring water and heating lines, but also produces a neat, handsome installation of which you can permanently be proud. Where space is at a premium, this tube, with soldered fittings, offers an extra advantage.

Revere Copper Tube (99.9% pure copper) is seamless and is cold drawn with a gun-barrel finish inside. It is deoxidized and is free from flaws and blemishes. Joints are made with either soldered or compression fittings.

Designed for water supply, heating, air conditioning and other services in all types of buildings, this tube is stamped with the Revere name and type at regular intervals. Look for these identification marks—they insure full wall thickness and the close gauge tolerances so essential for tight sweated joints.

In making your plans you can specify or use such long-lived Revere materials as Copper Tube and Pipe; Red-Brass Pipe; Sheet Copper for tanks, ducts, pans and trays; Sheet Herculoy for tanks; Dryseal Copper Refrigeration Tube (dehydrated and sealed); copper oil burner, heat control and capillary tubes.

Revere materials are handled by Revere Distributors in all parts of the country. The Revere Technical Advisory Service, Architectural, is always ready to serve you. Call your Revere Distributor.

COPPER ENDURES

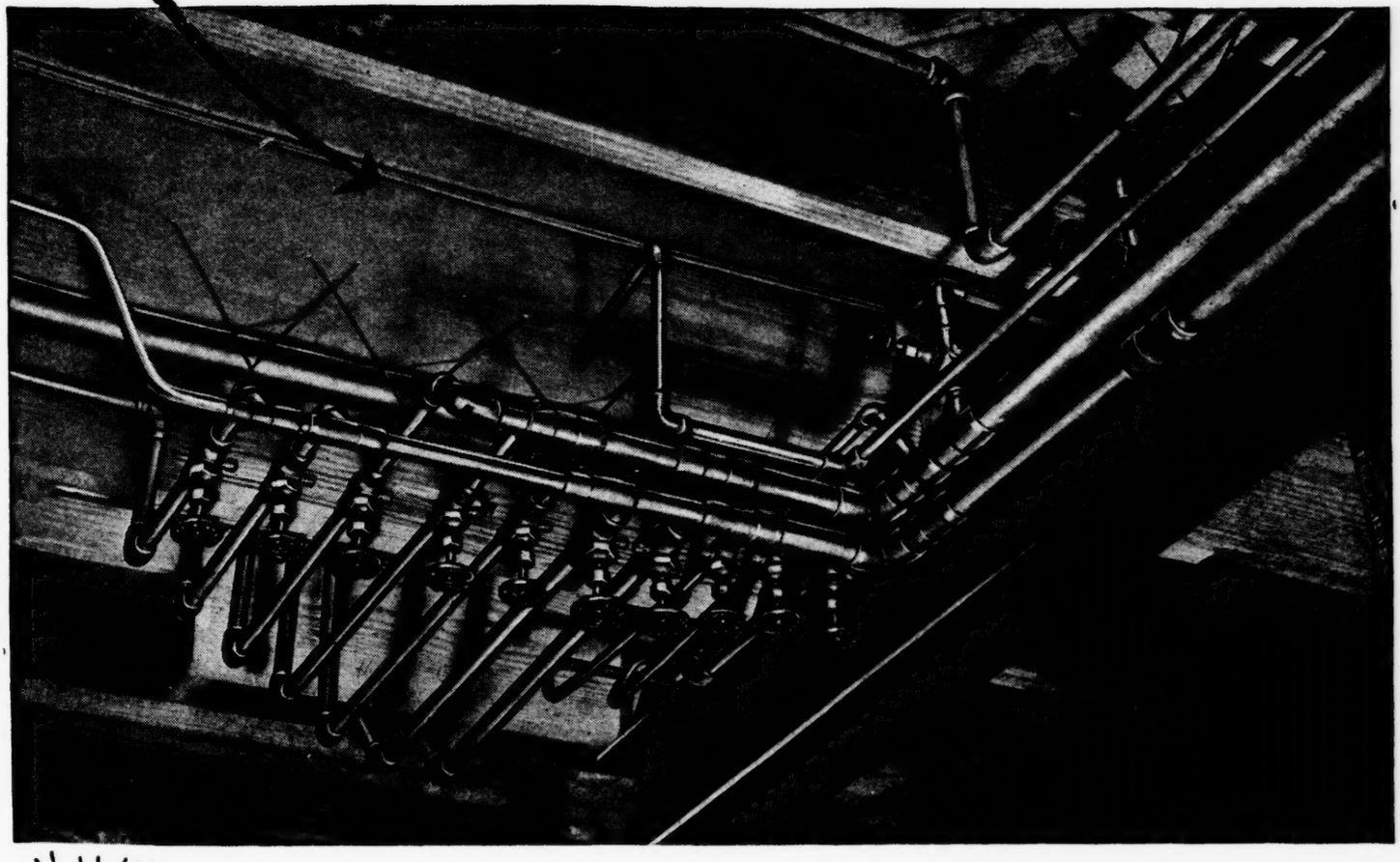
REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N. Y.

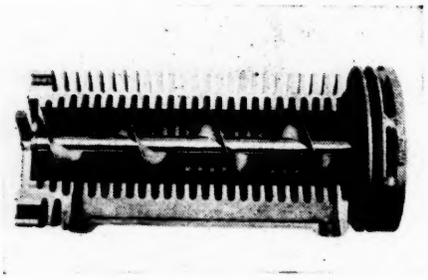
Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y. — Sales Offices in Principal Cities.



Listen to The Human Adventure *on the Mutual Network every Wednesday evening, 10 to 10:30 p. m., EWT.*

Temperature Exchanger

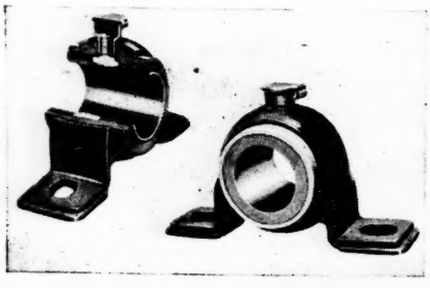
NAME — Bird-White temperature exchanger.
PURPOSE—The use of centrifugal action in a temperature exchanger based on the principle of heat transfer.
FEATURES — The device has external and internal cooling fins. Velocity of the element under pressure, such as air or gas, revolves the helicoid flighting at high speeds and forces the gas outward against the internal cooling fins. These internal fins rapidly absorb the heat and dissipate it to the outside atmosphere. By this cool-



ing action, vaporized moisture and oil suspended in the element condenses and is entrained in the sump to assure a moisture-free cooled element at the discharge point. The design permits tandem installation to any required length or parallel assemblies for accommodating large air volumes.
LITERATURE AVAILABLE—Bulletin 12.
MADE BY — *Bird-White Co., 3119 W. Lake St., Chicago 12, Ill.*

Fan Bearing

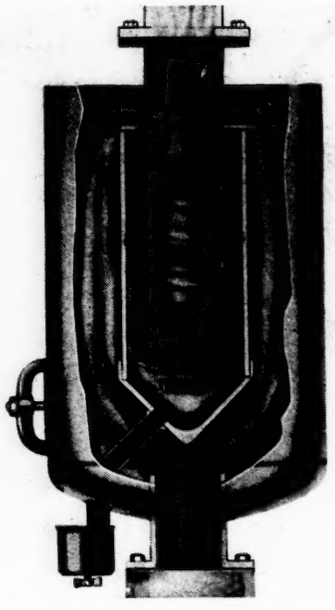
NAME—Type F Bronzoil Bearing.
PURPOSE—A low priced bronze bushed bearing for small shafts, especially adapted for fan and blower service.
FEATURES—Bearing is fully self-aligning. Bushing has a shoulder which



provides a broad, flat bronze bearing surface that is always lubricated. An oil reservoir with a close fitting wick surrounds the bronze capillary bushing and supplies the required amount of oil as needed. Steel base is sprung slightly when hold down bolts are tightened. This permits free self-alignment while maintaining the inner housing in its correct position.
MADE BY—*Dodge Manufacturing Co., Mishawaka, Ind.*

Silencer and Spark Arrester

NAME—Sims Whittington silencer and spark arrester.
PURPOSE—To silence the exhaust roar from internal combustion engines.
FEATURES—Exhaust gases rapidly lose velocity in the large cylindrical chamber. They are diffused upward upon contact with the cone casting and



whirl tangentially into impeller through vanes. Solid particles in suspension are ejected through centrifugal action against fins at the periphery of rotation. These particles drop inside of the lower cone and on through to the trap. Cleaned gases pass upward into the extended tail pipe section.
SIZES AND CAPACITIES—Made in 15 sizes for engine outlets from 1 through 18 in.
MADE BY—*The Sims Co., Erie, Pa. Distributed nationally by Whittington Pump & Engineering Co., 225 So. Meridian St., Indianapolis 4, Ind.*

Refrigeration Lubricant

NAME—Lubricant.
PURPOSE—For lubrication of refrigerating machines and other machinery operated at low temperatures.
FEATURES—Lubricant can be manufactured to any desired viscosity and is wax-free. Pour-points vary from —30 to —80F. Flash points range from 300F up, densities approximate that of water. Carbon residue values are less than 0.01%, regardless of viscosity. Lubricant is characterized by low change of viscosity with change in temperature, having viscosity indices in the range of 140 to 160. Contains no petroleum oils.
MADE BY—*Carbide and Carbon Chemicals Corp., Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.*

Neoprene Check Valve

NAME—Permatite Valve.
PURPOSE—To act as a check against back flow of any gas or fluid that will not attack synthetic rubber.
FEATURES—Said to be designed along entirely new principles, this valve has no poppets, discs, or other metal working parts. Back-flow is checked by a Neoprene synthetic rubber tubing which opens with either vacuum or pressure, permitting direct flow, and closes when flow is stopped. Valve installations, say the manufacturers, are simplified because no manholes, sleeves, or extractors are required where valves are buried. The tubing is said to be permanently

tight and its opening and closing movements are such as to prevent foreign matter from fouling the valve or causing leakage. The Permatite Valve may be used as a foot valve, vertical, horizontal or angle valve in any suction or discharge line.
SIZES—½, ¾, and 1 in. sizes up to 125 lb per sq in.
MADE BY — *Harman Equipment Co., 937 Santa Fe Ave., Los Angeles, Calif.*

Pipe and Tubing Tool

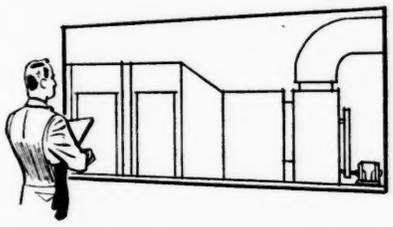
NAME—Power-driven tubing tool.
PURPOSE — For cutting, scraping or polishing the inside of fitted pipe boiler tube and tubing.
FEATURES—Driving mechanism is a motor driven head which is removable from the stand. In operation, the driving unit is held at the pipe opening so that the desired length of

flexible rod may be fed into the pipe. Comes with 100 feet of flexible steel shafting which automatically uncoils as it is fed from its container. Attached to rod is elliptical shaped spring steel cutter which is normally operated at 300 rpm.
MADE BY—*The Spartan Tool Co., 6007 Lincoln Ave., Chicago 45, Ill.*

THREE MEN ON AN AIR FILTER

—they all agree on Dust-Stop Air Filters!*

When the man who engineered the system—the man who bought it—and the man responsible for keeping it operating at high efficiency, continue to give Dust-Stops their enthusiastic approval, year after year—it's evidence of a preference worth investigating.



The Heating and Ventilating Engineer
prefers Dust-Stops and the patented and complete, ready-to-assemble steel cell frames because of their ready adaptability to virtually any system, regardless of the C.F.M. requirements.

The proved efficiency of the Dust-Stop, flexibility of installation, easy access to filters, and the low cost of this part of the system are but a few of the other reasons why so many engineers have standardized on Dust-Stops.

The Treasurer,
with an eye to original cost and upkeep, bases his preference on his cost records. They show that his company is obtaining the advantages of efficient air filtering at a low initial cost and at low upkeep cost.

AND the Maintenance Engineer
casts his vote for Dust-Stops because they help him keep his budget down. Maintenance and/or replacement of Dust-Stops in the "L" and "V" frames are accomplished with a minimum of man power and time. There is no storing problem — low-cost replacement Dust-Stops can be quickly obtained from near-by suppliers. And the expense, nuisance and other difficulties of laundering are avoided.

Further proof of the preference for Dust-Stops is their use in factories, commercial buildings, schools and institutions from coast-to-coast — and their specification by design engineers as component parts of many types of machinery to protect precision parts, increase efficiency or to facilitate operation under adverse conditions.

The Dust-Stop Air Filter is made of packs of glass fibers coated with an adhesive, faced with metal grilles and bound on the edges with a fiberboard frame. The high efficiency of Dust-Stop Air Filters is made possible by the Fiberglas filter medium and the nonodorous, nonevaporating adhesive.

Due to extraordinary wetting power each particle of dust acts as a wick to carry adhesive to other particles. Therefore, the effectiveness of the Dust-Stop is maintained until it becomes heavily coated with dust.

For complete information and typical installation details for both "L" type and "V" type frame arrangements see Sweet's Files or write: *Owens-Corning Fiberglas Corporation. 1912 Nicholas Bldg., Toledo 1, Ohio. In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.*

DUSTOP AIR FILTERS

*T. M. REG. U.S. PAT. OFF.

ARMY E NAVY

—a FIBERGLAS product

NEWS OF THE MONTH

WHAT ABOUT STEAM?

An answer to "What's the matter with one-pipe steam?" is in the offing due to I-B-R sponsored research.

• **RESEARCH.**—The one-pipe steam heating system, technically neglected for years but nevertheless highly popular in certain areas during the nineteen twenties and early thirties, is finally scheduled to undergo careful performance tests. These tests will be conducted at the University of Illinois during the coming heating season as a continuation of the research program of The Institute of Boiler and Radiator Manufacturers. The system, located in the I-B-R Research Home adjacent to the Illinois campus, will be automatically fired, will have recessed radiators during part of the season, radiant baseboard radiators for the remainder of the year.

• **OBJECTIVES.**—Among the more important objectives of the study will be to determine: (1) if a steam main less than 2 inches in diameter can be used on a one-pipe system of residential size; (2) operating characteristics of vacuum and non-vacuum types of radiator vent valves; (3) advantages of splitting the system into two circuits as compared with one circuit; (4) fuel savings effected by preventing circulation of air through the boiler during off periods; and (5) fuel savings resulting from use of outdoor air for burner and draft regulator. Also included in the general objective will be a comparison between a one-pipe steam and a hot water heating system with respect to cold 70 and the types of controls needed for best results with a steam system.

• **I-B-R CONTRACT.**—Announcement of the foregoing 1945-46 research program was made simultaneously with a report from I-B-R that its research contract with University of Illinois had been extended to cover the year from July 1, 1945 to June 30, 1946. The cooperative arrangement began in 1940 and has resulted in the publication of several bulletins under the imprint of the University's Engineering Experiment Station, as well as a number of ASHVE papers. The Research Home, built by I-B-R funds, is under the direction of Prof. W. S. Harris and occupied by Illini students.

The work at Illinois is conducted under the general supervision of I-B-R's Research Committee, of which S. K. Smith, vice-president of The H. B. Smith Co., Inc., is chairman.

• **RATING CODE.**—I-B-R also has revised its boiler testing and rating code for low pressure heating boilers, included all amendments since the July, 1940, edition, and will have copies available shortly. L. N. Hunter, vice-president of The National Radiator Company, is chairman of the Boiler Technical Committee in charge of this code.

• **WATER HEATING.**—R. L. Blanding of the Taco Company is chairman of the Institute's sub-committee on water heating, which has drawn up a code for the testing of indirect water heaters. The procedure prescribed in the code is now being checked by a test set-up in the University of Illinois laboratories. The tests, which cover heaters used in one- and two-family dwellings, will determine the capacity of these heaters when operating with a given inlet water temperature and a given outlet water temperature at several different boiler water temperatures.

• **INSTALLATION GUIDES.**—The sub-committee on water heating is also engaged in the preparation of an installation guide covering selection of heater and tank sizes, location of controls, connections to the boiler, location of heater, types of storage tanks, connections from heater to the storage tank, insulation, valves and drains, and tax on the heating boiler. This guide will presumably be on the same pattern as the I-B-R Installation Guide No. 1 covering one-pipe forced hot water which appeared last fall. There is now in preparation "I-B-R Installation Guide No. 2" covering one-pipe steam systems. Installation guides on radiant heating systems and on radiant baseboards are contemplated.

• **RADIATORS.**—J. F. McIntire, president of the United States Radiator Corporation, is chairman of the Radiation Technical Committee which has suggested that Simplified Practice Recommendation R-174 be amended to show the elimination of four-tube radiators 19 inches high and six-tube radiators 14 inches high.

The Engineering Experiment Station of the University of Illinois will shortly publish a bulletin to be entitled "Study of Radiant Baseboards in the I-B-R Research Home," by Professor A. P. Kratz and W. S. Harris. This bulletin will summarize the excellent results obtained during the last two heating seasons with a type of radiation which is located at the floor level and which extends, more or less, along the entire length of the exposed walls of the rooms.

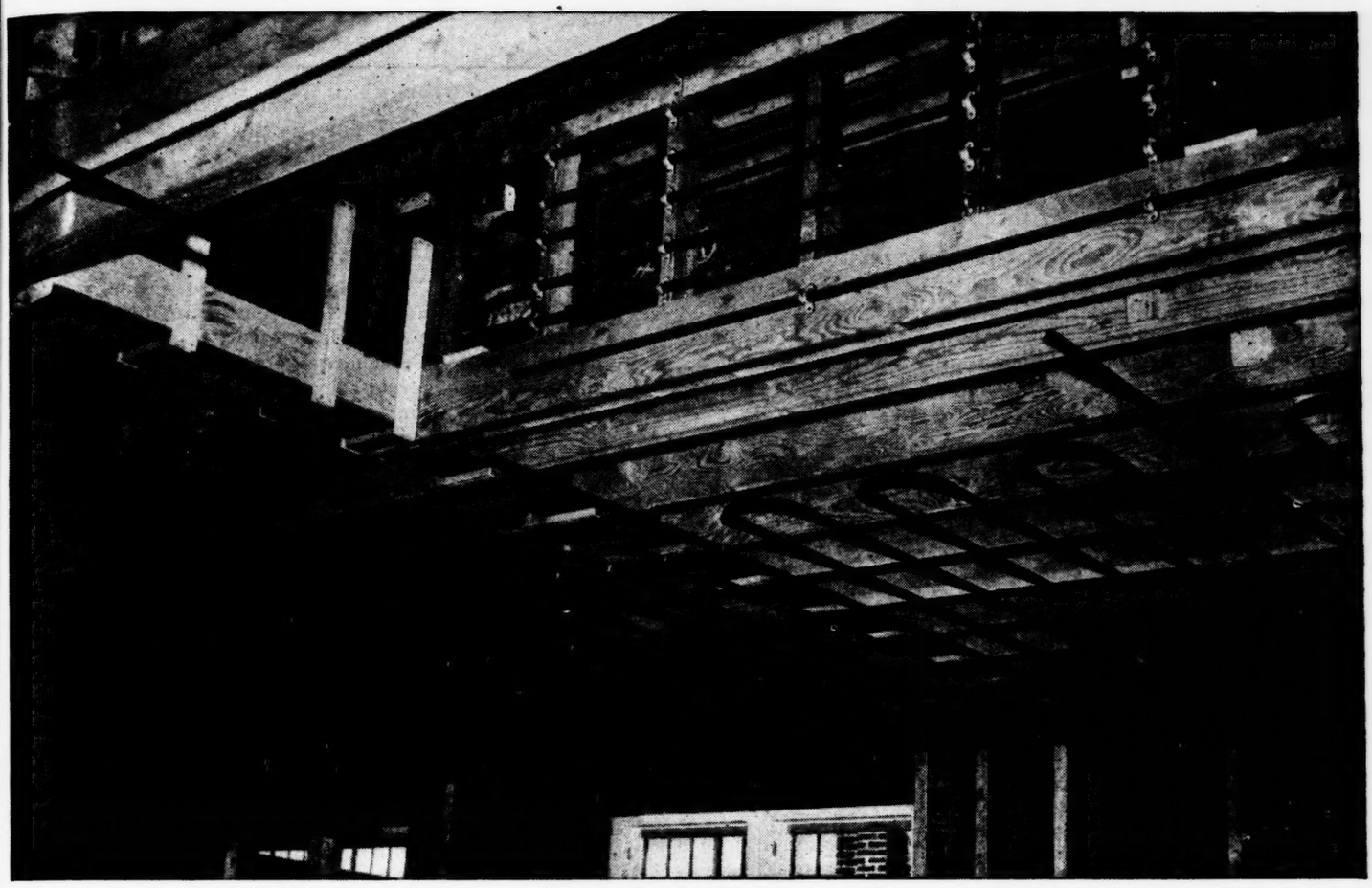
• **$400,000 TEST.**—A new project at the University of Illinois contemplates a four-block area containing a $400,000 demonstration center and production yard with three blocks of test houses surrounding it. This arrangement will provide many opportunities for conducting related experiments simultanecusly.

The new project is planned by the Small Homes Council of the university, headed by William H. Scheick. The work will utilize the university's faculty of experts in many fields. Plans have been approved by the University Board of Trustees.

The Demonstration Center and Production Yard will provide unlimited possibilities for applied experiments which cannot be done in the fixed surroundings of individual research homes. It will have the flexibility of a great Hollywood studio and stage, permitting experiments with complete model homes without the expensive restrictions involved on an exterior site. A home may be built with cut-away sections, or without a roof for demonstration or photography.

It will have facilities for short courses and many other activities for builders, contractors, dealers, workers, and the public. It will provide an opportunity for acquainting workers with new developments, materials, and methods. In this sort of training the university also has had experience for it has given many practical short courses.

• **AND WARM AIR.**—The Research Advisory Committee of the National Warm Air Heating and Ventilating Association, at a meeting on June 5 and 6, proposed through chairman F. G. Sedgwick that the association dispose of its present warm air research residence and build a new, smaller, more representative research residence in connection with the University of Illinois Small Homes Council Project. The board of directors approved, and the research committee was authorized to proceed with plans. For the purpose, a sub-committee consisting of G. W. Denges, chairman, Professor Konzo, E. A. Jones, and R. A. Gulick was appointed.



HERE IS THE PIPE FOR *Radiant Heating*

Its strength, high ductility and easy weldability make Ammonoduct the ideal pipe for radiant-heating installations.

The pipe coils that radiant heating calls for are made quickly and at little cost with Ammonoduct, because Ammonoduct *bends cold!* You can bend it to very close centers, either in your shop or on the job, without the bother and expense of heating. You'll like the way Ammonoduct welds, too. Even a welder of little experience can make welds that are sound, and free of pinhole leaks.

Another advantage: Ammonoduct's coefficient of expansion approximates that of concrete or plaster, thus making a certainty of a tight, permanent bond between the pipe itself and the concrete or plaster in floors or ceilings.

Ammonoduct is made by the continuous-weld process from a special grade of low-carbon open-hearth steel developed by Bethlehem metallurgists. That's what gives Ammonoduct its remarkable strength and ductility, making it so easy to work and to weld.

With all its advantages of cold-bending, weldability, easy cutting and threading, Ammonoduct costs no more than regular steel pipe. Your Bethlehem pipe distributor can supply you with Ammonoduct in uniform 21-foot lengths, plus or minus 1 inch, standard weight or extra strong.

AMMONODUCT

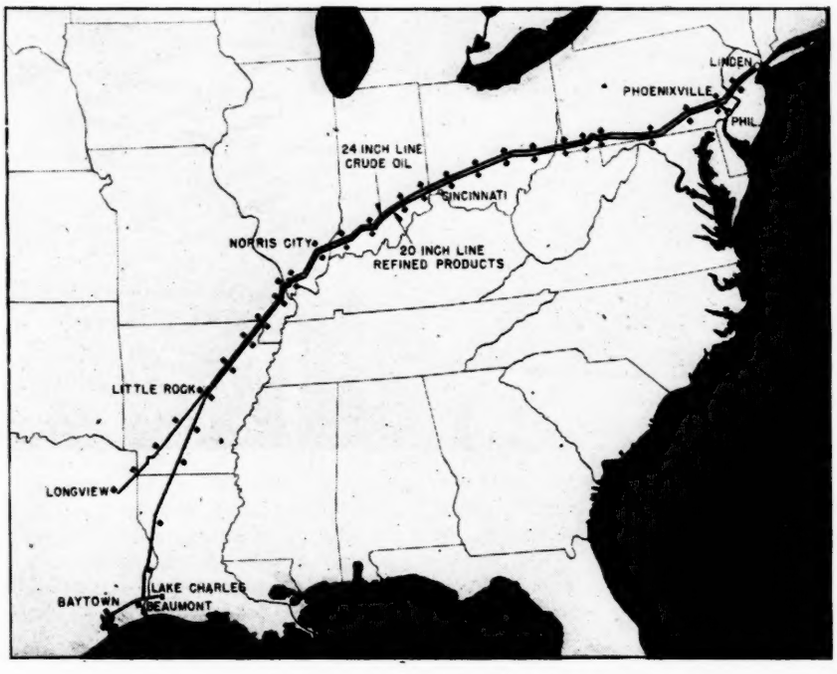
EASY WORKING . . . BENDS COLD

BETHLEHEM STEEL

BIG INCH BOOSTERS

Seven-ton pressure drop in cross-country oil line overcome by 26 booster stations.

• **WHY BOOSTERS.** — Back in the days when bewhiskered volunteer firemen operated the hand pumpers, good muscles and a strong "wind" were needed. Strong backs were the motive power that sent a weak hose stream from one pumper to another to be boosted in pressure before reaching the red helmeted fireman at the nozzle.



Route of Big Inch across 9 states. In spite of daily average in July of 320,000 barrels for 24-in. line and 150,000 barrels for 20-in. line, Deputy Petroleum Administrator Ralph K. Davies says civilian supplies will be tight this month.

Relay pumping is still the common thing. Without it, for example, the Big Inch pipe line would require a pump with a discharge pressure of 15,250 lb per sq in to force 300,000 barrels of oil a day from Longview, Tex., to Phoenixville, Pa. Such an impossible design was avoided by the use of 26 booster stations which, like the historic hand fire engine, boost the line pressure in easy stages.

This and other interesting facts about the Big Inch were revealed by Merritt A. Hyde, petroleum engineer, Westinghouse Electric Corp., in a recent talk before the Michigan section of the American Institute of Electrical Engineers.

Big Inch, 24 in. in diameter, runs underground for 1,400 miles from Longview to Phoenixville. There it forks into two 20 in. lines, one to the Philadelphia area 40 miles away, and the other 90 miles to serve the New York area. Elevations are from 300 ft at Longview to a maximum of 2,990 ft at the Laurel Hill crossing in Pennsylvania.

Through this system daily moves 300,000 barrels crude oil at a rate of 4¼ miles an hour. The line itself contains 4,000,000 barrels crude weighing 600,000 tons. The job of pumping oil in Big Inch represents the expenditure of nearly 100,000 hp.

For this extensive pumping job, the 26 pumping stations were spaced at an average interval of 52 miles. Actually because of hills, the spacing is such that the pressure boost developed is equalled by the static head difference between two succeeding stations, plus the friction drop at capacity flow for the line between the two stations.

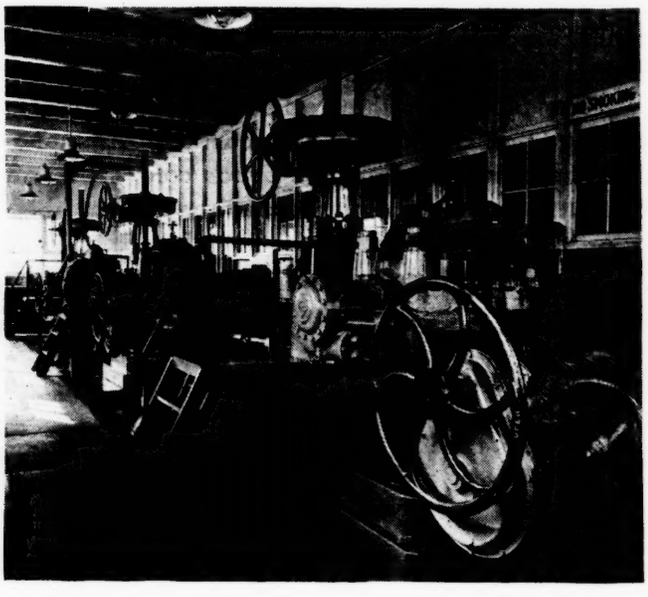
• **PUMPS.** — Generally each station has three electrically driven centrifugal pumps of 1,500 hp each. With spare units and auxiliaries, the total installed horsepower is about 130,000. The pumps are single stage, rated at 8,750 gpm, 648 ft head when operating at 1,780 rpm. Each pump has a manually operated 16 in. suction valve and a 12 in. discharge valve. Because of the explosive nature of air in the pump room, due to drainage from pump glands, electrical push button controls are of the explosion proof type.

Friction in the line is responsible for a pressure drop of 12 lb per sq in per mile against a static head of 50 lb per sq in. Net input pressure at each station is about 675 lb per sq in and when the static pressure of 50 lb per sq in is added the resulting maximum line pressure is 725 lb per sq in.

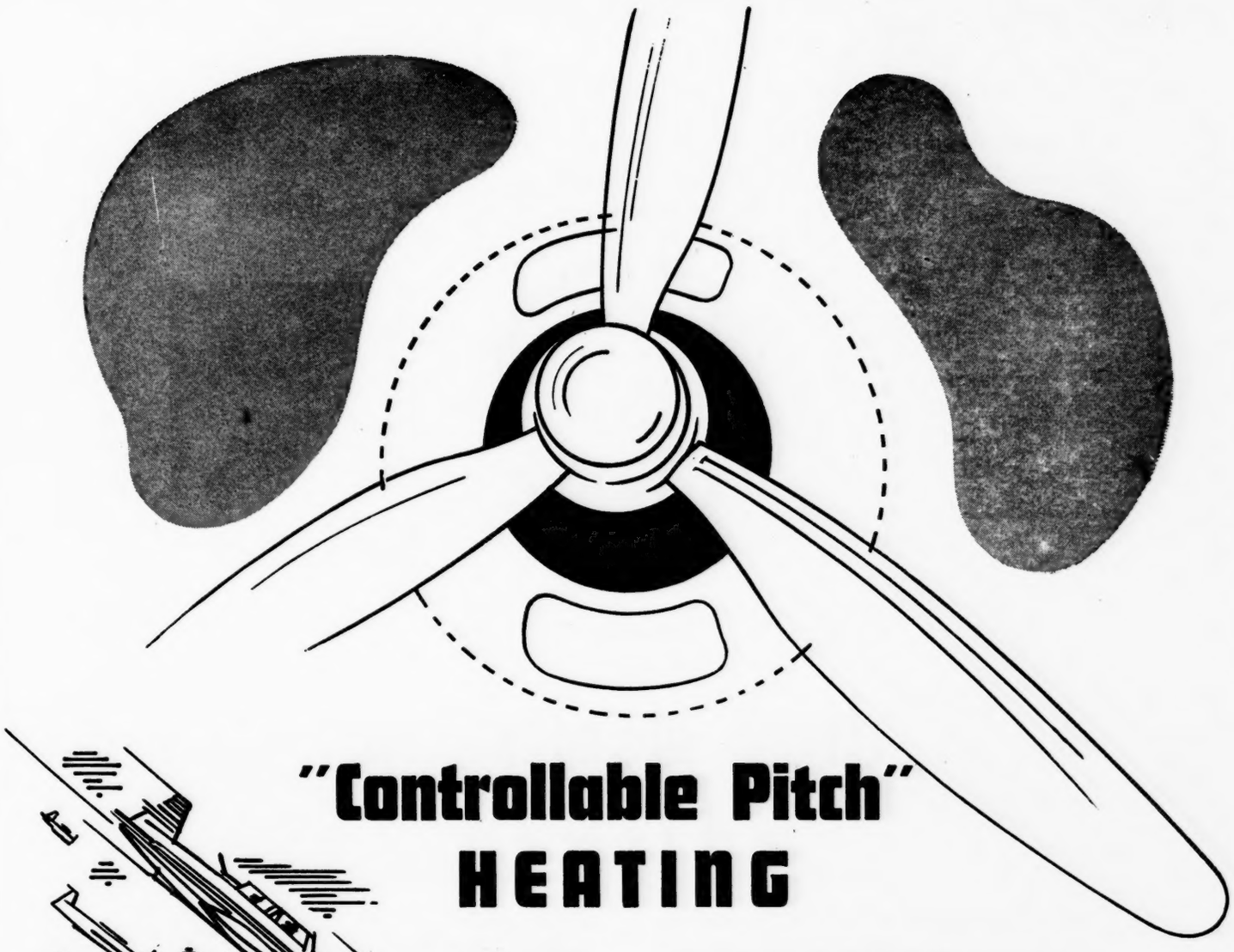
• **POWER.**—Since pumping station locations were fixed by the hydraulics of fluid flow, the power service to operate the pumps had to be brought to the sites selected. Power is delivered by 16 utility companies along the right of way. In one case 120 miles of new power lines had to be erected to serve three stations.

Electric motors are of the squirrel cage induction type. They are ventilated at both ends with an air discharge through the top of the motor frame. The warm discharge air is drawn into a duct and is then expelled through the roof by a small motor driven blower. Circulation of the warm air is used to heat the stations during the winter.

Pumping units are controlled from the dispatcher's office in Cincinnati, Ohio. A telephone system with loud speakers permits intercommunication between dispatcher and all operators.



IF all 26 Big Inch booster stations like the one shown here were rolled into one, it would have a discharge pressure of 15,250 lb per sq in. Actual net input pressure at each station is 675 lb per sq in. Most stations have three centrifugal pumps of 1,500 hp each. Pumps are single stage rated at 8,750 gpm.



"Controllable Pitch" HEATING

The pilot of the modern airplane varies the angle of the blades of his propeller by pushing or pulling a lever. At the take-off the blades take the air in small bites (corresponding to low speed in your car). When altitude is gained he no longer needs full power and the blades take the air in big bites. This flexible adjustment saves both fuel and power.

This is a close parallel with Dunham Differential Heating with one exception: "Differential" is automatic. The operator sets a dial (as he would his radio) to the room temperature he wants and then without his further attention, through all the changes of weather, regardless of their speed and frequency, the right amount of heat is delivered to exactly balance the heat loss of the building.

In zero weather "hot" steam (212° or more) is circulated, but degree by degree as the weather moderates the temperature of the steam declines. In average Winter weather, "warm" steam (209° to 178°) is circulated. On mild days sub-atmospheric steam (166° down to 133°) is circulated. Further reduction of heat output from radiation is obtained by partial filling.

This is *flexibility* and *adequacy* far beyond the range and mechanical ability of the ordinary system. And this is *economy* which sets a new standard, both in fuel use and in manpower costs for supervision and maintenance.

A request on your business letterhead will bring you complete technical data. May we send it? C. A. Dunham Company, 450 E. Ohio Street, Chicago 11, Illinois.

Fuel-Saving Starts With CONTROL

DUNHAM

DIFFERENTIAL HEATING

CHICAGO • TORONTO • LONDON

HEAT + COLD + POWER = 1

Self-contained units for heating, refrigeration and power requirements for homes proposed by Grebe and Oakes working independently.

• **ALL-IN-ONE.**—Combining the heat-power functions of a house into one unit has long been dreamed of. Until recently, however, the diesel-driven generator, with waste-heat and off-peak energy used for heating, was the nearest approach to realization of this ideal.

Two different approaches to the problem were publicized last month. Dow Chemical Company's Dr. John Grebe, in a talk before a local group, described a unit developed by him for Dow and now in blueprint form—a 3500 lb kitchen-bathroom unit to supply heat, refrigeration, hot water and other functions. Dow-Therm, with a boiling point of over 500F, is the medium carrying heat energy to various heat exchangers for heating the rooms, hot water, absorption refrigeration and so on. Dow's interest in the unit is said to be in the magnesium and insulation employed in its manufacture.

The second approach is that of O. O. Oakes, widely known through his years of association with American Radiator and one time president of the New York chapter of the ASHVE. Mr. Oakes, now with John B. Pierce Foundation, has developed a unit using a medium with a boiling point of 817F. The Foundation and its inventor referred to the system as liquid heat. The medium is a tetracresyl silicate—an organic salt from silicon and coal tar. Any fuel could be the source of heat and here, too, heat exchangers would transfer heat from the medium to kitchen cookers, heaters, refrigerators and to a steam turbine for driving an a.c. generator for lighting.

• **COMPETITION.**—Utility companies are interested in both developments. Such a combined unit could seriously compete with plans of both electric and gas utilities, although the cost of such units might be such as to handicap them seriously. On the other hand, isolated communities might prove a fertile primary market.

Advantages and claims of the Pierce Foundation system were summarized as:

(1) It is independent of gas and power lines;

(2) Such a system would provide mechanical services at a fuel saving of nearly 50%; and

(3) No danger of burst pipes or leaks.

• **GADGETEERING.**—Some of the devices said to have reached an advanced experimental stage are:

(1) A cooking unit which, when not in use as a cooker, becomes a dishwasher;

(2) A piping system of copper tubing through which the high temperature medium flows to the various appliances, with returns to the boiler for reheating;

(3) Heat exchanger containing hot liquid coils submerged to furnish continuous water supply;

(4) Refrigerating system of the absorption type (such as the Servel or Williams Air-O-Matic) for cooling rooms in summer;

(5) Refrigerator of the absorption type;

(6) Extended surface coils for heating air supply to rooms in winter;

(7) Low pressure steam turbine-generator; and

(8) High temperature centrifugal pump for circulating medium through system.

The Pierce Foundation was set up by funds provided by the late John B. Pierce, a former American Radiator president, for the purpose of improving the habitations of men. American Radiator disclaims official connection between it and the Foundation.

TO THE WEARERS OF THIS EMBLEM

SIGNIFYING HONORABLE DISCHARGE FROM THE SERVICE OF OUR COUNTRY

WELL DONE AND WELCOME HOME

HEATING AND VENTILATING

SNOW MELTING

Data on snow melting by underground pipe lines is released in Byers case study.

• **PIONEER.**—The first known system specifically designed for snow melting was installed in 1925, according to information released by A. M. Byers Co. in its *Case Study No. 4*, a progress report which brings together available information about snow removal through the use of sub-surface wrought iron heating pipes.

Byers reports that Rochester Gas & Electric Corp., when erecting a new office building, placed steam pipes beneath the sidewalk on two sides of the building. On one side the walk was 150 ft long by 5 ft wide and on the other was 100 ft long by about 10 ft wide.

The basement of the building extends under the walk to the curb line. Wrought iron 1½ in. pipe in six-pipe grids was placed about 14 in. below the walk and inclosed by a sub-ceiling. There was no contact of pipe with either sub-ceiling or sidewalk. Pipes were on about 6 in. centers.

Low pressure steam from the boiler plant in the building is admitted manually whenever snow removal is desired. One engineer estimates the running cost to be about $5 a day.

• **HOT WATER.**—In 1940 Joseph C. Keaney got tired of shoveling snow from his 110 ft sloping driveway. He tore up two 24 in. concrete ribbons and laid two runs of 1¼ in. pipe on 8 in. centers under each ribbon. He filled in with gravel and covered over with a blacktop surface. Prestone treated water is circulated from an instantaneous gas-fired water heater in the garage. With his large capacity heater and pump, Mr. Keaney says he melted about ½ in. of ice in 20 minutes from a

● The products of one of the foremost design staffs in the industry, usAIRco Coils and Blowers are working with dependability and efficiency on thousands of jobs of war in factories, shops and camps. Their record of usAIRco Blowers in ships of the Maritime Commission, one of the toughest blower assignments, is outstanding. Simply designed and ruggedly constructed, all the inbuilt worth of usAIRco products is now ready to serve your most exacting requirements. usAIRco is in a position to give prompt delivery on essential orders.

UNITED STATES AIR CONDITIONING CORPORATION

SERVING INDUSTRY WITH FINE EQUIPMENT FOR ALL AIR PROCESSING REQUIREMENTS

NORTHWESTERN TERMINAL MINNEAPOLIS 13, MINN.

dead cold start. He also removed a 15 in. snow fall in two hours at a fuel cost of about sixty cents.

A sidewalk installation of Sarco Mfg. Corp. (see June 1945 and August 1944 H&V) was designed for steam but changed to water when it was found that condensate froze.

• **STEAM.**—At Hewitt Rubber Corp. a truck driveway 80 ft by 8 ft was fitted with two runs of 1¼ in. wrought iron pipe on 4 ft centers. Pipes were covered with 12 in. wide strips of roofing felt, and a 6 in. slab of concrete was poured. Near the top of the slab directly over the heating pipes 18 in. strips of reinforcing mesh were included to act as temperature distribution elements.

Exhaust steam at 10 lb absolute pressure circulates constantly through the winter months. A 14½ in. snow fall on the night of December 11-12, 1944, was entirely cleared six hours after the fall had stopped.

Another driveway, where ¾ in. pipe in grids constantly circulates exhaust steam, is giving satisfaction at a Packard Electric plant in Ohio.

• **CONCLUSIONS.**—Byers' case study draws the following conclusions:

(1) If heating pipes are not in contact with the ground or concrete, either steam or hot water may be used;
(2) For embedded pipes, use steam only when operation is continuous; and
(3) For intermittent operation of embedded systems, it is advisable to use hot water, either with antifreeze or equipped with positive drainage.

SURVEYING SURVEYORS

At least six recently completed surveys attempt to throw some light on plans and possibilities for postwar manufacturers and consumers.

• **SURVEYORS.**—Figures on post-war buying and manufacturing plans have been released by the refrigeration Equipment Manufacturers Association, Equitable Trust Company of Wilmington, Del., U. S. Department of Commerce, Federal Power Commission, The Curtis Publishing Co., and the National Association of Manufacturers. Only one basic question was comparable between two or more of the questionnaires distributed. Both Curtis and Equitable Trust asked how much home owners expected to pay for new or renovated heating systems. The answer was $338 and $530 respectively. The difference probably is attributable to geographic and income differences in the populations sampled.

• **REMA.**—*The Refrigeration Equipment Manufacturers Association* reports that, in addition to a huge demand for new mechanical refrigeration and air conditioning equipment after the war, more than $70,000,000 in new parts will be required. To that sum will be added many millions in labor and engineering services supplied by refrigeration and air conditioning firms, according to F. J. Hood, recently elected president of the association. Mr. Hood bases his figures on a report by H. T. McDermott, secretary of the Refrigeration Service Engineers Society.

As an example of the existing situation, Mr. Hood points out that over half the refrigerating equipment in use by the meat industry is 15 years old or more. This means, he says, that much of it either is badly in need of repair or should be replaced.

(REMA directors will meet in Marinette, Wis., on August 15 as guests of Mr. Hood in observation of the organization's 10th anniversary. Organized by less than a dozen companies in 1935, REMA now includes 80 members.)

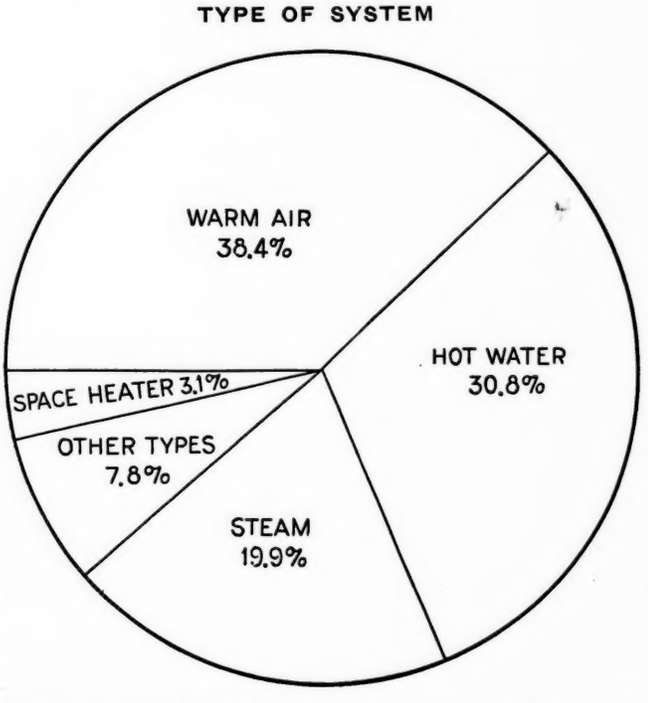
• **DELAWARE CONSUMERS.**—*Equitable Trust Co.* of Wilmington surveyed Delaware consumers during October, 1944. Tabulation of 2,000 representative replies showed that 9% of the sampled population will replace or renovate their heating systems at an average expected cost of $530. Home freezers are in the post-war plans of 10% of the questionees who expect to pay about $326 for this type of unit.

• **UNCLE SAM.**—*The U. S. Department of Commerce* estimates on the basis of a widely distributed questionnaire that manufacturing industries plan to spend $4.5 billion for plants and equipment during the next 12 months. The Department emphasizes that these are plans, not commitments, and depend on many factors including the ability to obtain materials. It may be noteworthy that this estimated figure is nearly three times the prewar average and compares with a peak of $2.75 billion in 1929.

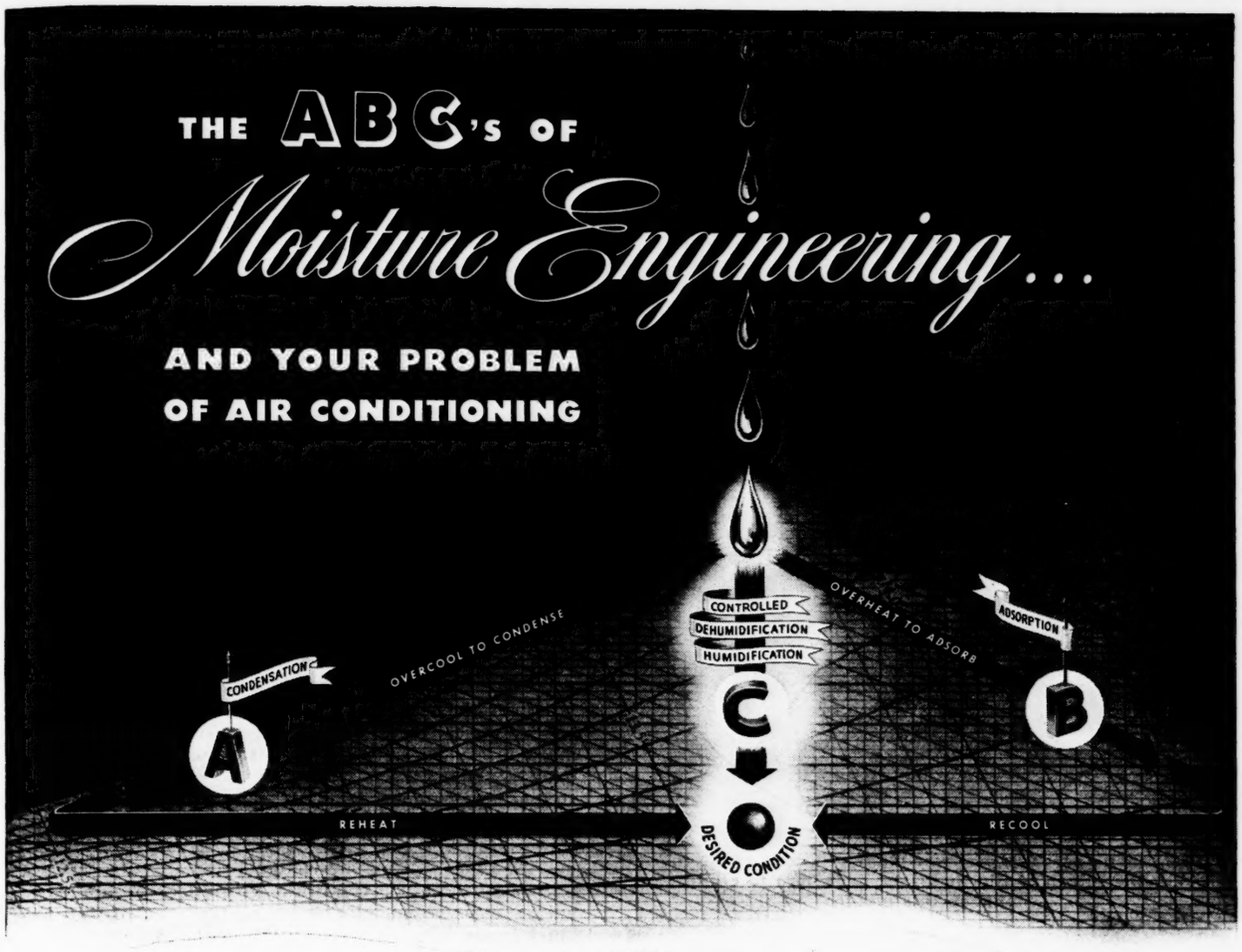
• **UTILITIES.**—*The Federal Power Commission* reports that utility companies plan expenditures of $1 billion in the next year on plants and equipment, inventory increases, and maintenance. A bulletin of the National City Bank of New York points out that neither the Department of Commerce nor the Power Commission surveys include railways, residential construction, public works, or the trade and service industries. Evidence is, says the bulletin, that plans will be carried forward without regard to a moderate business recession during the transition period.

• **HOME PLANNERS.**—*The Curtis Publishing Co.* recently completed a survey to determine what the home planner expects from the home building industry after the war, especially with regard to heating and air conditioning equipment.

Warm air house heating is preferred by 38.4% of the prospective home owners interviewed, a hot water



CURTIS Publishing Co. found that warm air and hot water were most popular residential heating systems. **See "What About Steam?" on page 106.**



Humidity can be the factor of success or failure in any plan for air conditioning. Unless it is properly controlled the result will be CHILL, SHOCK and CLAMMINESS in personal comfort atmospheres, or excessive cost of OVER-COOLING and REHEATING, or OVER-HEATING and RECOOLING to obtain the proper industrial processing atmosphere. Kathabar Systems operate independently of temperature and dehumidify or humidify to obtain the desired condition.

The above illustration is a common air conditioning problem. Three methods of approaching this problem are available.

Method A—(Condensation) Over-cooling the air to precipitate the moisture and then reheating to raise the temperature to the desired condition.

Method B—(Adsorption) Over-heating the air to arid dryness, then recooling to the desired condition.

In most instances it is difficult to maintain these conditions accurately.

Method C—(Kathabar System) Absorbing the moisture from the air, independently of temperature, and in accordance with predetermined control. Kathabar operation is thus the only direct, single function method in this instance. It will accurately maintain and automatically control the humidity to the desired amount for the specific purpose—either for personal comfort or industrial processing.

Get acquainted with a Moisture Engineer in your territory. Hear his story of "functional air conditioning"—see the new MOISTURE ENGINEERING and Kathabar Application Chart.

"The Moisture Engineer" is a new bi-monthly bulletin devoted to moisture-humidity problems in air conditioning and to Kathabar Systems and their application. Circulation will be limited. However, additional names can still be added to territory lists at the present time. If you would like to receive it, write to—

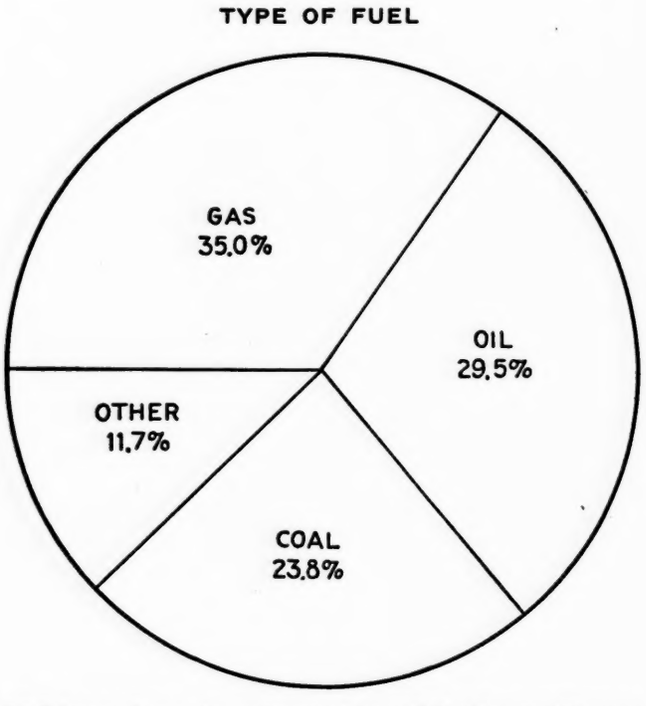
KATHABAR DIVISION, SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

AUTOMATICALLY CONTROLLING HUMIDITY FOR COMFORT AND INDUSTRIAL PROCESSING

Kathabar System of
HUMIDITY CONTROL
(ADVANCED AIR CONDITIONING)

system is the choice of 30.8%, steam is desired by 19.9%, and 3.1% want a space heater. Other types of house heat are mentioned by a few, and some had no choice.

Nearly all favor a central heating system. More than 35% want a gas heater, 29.5% want an oil heater, 23.8%



GAS looms large in post-war plans of Curtis questionees. Will the return of Big Inch (see page 108) to civilian oil change this picture?

a coal heater, 3.9% an electric heater. A few mentioned other types or had no preference.

For water heating purposes, the gas heater is the outstanding choice of prospective home owners, 53.8% favoring this type. More than 22% preferred an electric water heater, 13.9% oil, 5.8% coal, and a few mentioned other kinds.

Of all the families interviewed in the survey, 29.3% said that they expected to buy or install some kind of mechanical air conditioning when it becomes available. Oddly enough, purchase intent is stronger among renters than among present home owners. More than 30% of the former say they plan to buy air conditioning equipment compared to 27.4% of the later. As might be expected, interest in air conditioning is much higher among those in the upper income levels than in the lower brackets.

Of those who expect to purchase or install air conditioning equipment, 81.1% prefer some kind of central system, possibly one connected with or part of the heating system so as to obtain the year round benefits of air conditioning. However, 17.1% prefer an individual room cooler, and 1.8% indicated no preference or don't know. Renters display more interest in individual room coolers than do present home owners, and families in the Southern regions are almost all partial to this type of equipment.

The amounts these people expect to spend for air conditioning is largely determined by the type of equipment they plan to buy. In the case of the individual room cooler, most of them expect to pay about $189, and for central systems a little more than $250. More than half of these prospective buyers, however, have no definite ideas about price.

A separate questionnaire was designed to develop information among home owners on the subject of modernization and repair, and it revealed that of the owners who will make repairs, 13.4% indicate they will modernize their present heating systems, either in the form of a new installation or a reconditioning job. At least nine out of ten expect to buy an entirely new furnace and about a fourth specifically mention a gas furnace, nearly a fifth mention an oil furnace, while one in seven prefer a coal furnace with stoker. While about half of these owners do not know how much they will spend, the remainder will make an outlay of $338 for this purpose.

• **NAM.** — *The National Association of Manufacturers* made a nationwide survey of the employment outlook during the transition to peacetime production. Replies from 1,756 NAM members, including less than 2% from companies employing over 5,000 persons each, were recorded from 43 states. The survey reveals that post-war employment in manufacturing should be about one-third above the pre-war level.

* * *

Contractors Trained in Gas Heat

Los Angeles—As one phase of a broad program of activity designed to prepare installers of heating equipment for the post-war period and enable them to make the most of their opportunities in the forthcoming market in such work, the Institute of Gas Heating Industries of Southern California recently was host at a special dinner meeting here to mark the termination of the first Institute-sponsored class in gas heating installation.

With L. M. Hull of the Hammel Radiator Engineering Co., president of the Institute, presiding, the first graduating class, composed of 50 heating contractors and journeymen who completed the course were presented with certificates in recognition of their successful completion of training for installation of various types of heating equipment, such as floor furnaces, wall furnaces and central furnace systems.

Mr. Hull announced a second course was being organized for operation during the summer months. He disclosed also that the Institute had decided to broaden the eligibility by admitting to the classes not only heating contractors and their employees, but also merchant plumbers engaged in, or proposing to engage in, the installation of heating equipment, and their journeymen.

The classes are designed to teach contractors and journeymen installers the requirements for such work called for by municipal ordinance and the standards established by the Institute.

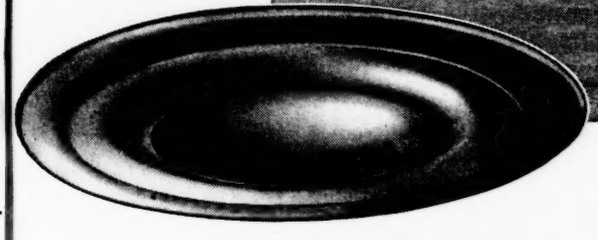
Seeley Made Dean

Durham, N. H. — Lauren Earl Seeley has been appointed as dean of the college of technology at the University of New Hampshire. He is associate professor of mechanical engineering at Yale University where he has taught since 1923.

He graduated magna cum laude from Yale in 1921 with the degree of Ph.B. and also holds M.E. and LL.B. degrees from that institution. His research has been concerned chiefly with heating and ventilation, including studies of oil and wood burning devices and the effect of relative humidity on the respiratory system.

Until recently Mr. Seeley has been regional advisor in Connecticut and Rhode Island for the Engineering, Science, and Management War Training program of the U. S. Office of Education. He is a special consultant to OPA on fuel oil and coal rationing problems and was a member of the committee which prepared the basic program for fuel oil rationing.

BARBER-COLMAN
ENGINEERED AIR DISTRIBUTION



IN THE 28 SHOP AT MARSHALL FIELD & COMPANY, CHICAGO

Marshall Field & Company, famous Chicago store, designed their 28 Shop as a luxury setting for the sale of their best lines of women's apparel. For maximum patron comfort, they included a good air conditioning system with VENTURI-FLO ceiling outlets to assure uniform draftless air distribution. These outlets are mounted on the strikingly distinctive circular light soffit, as seen in the picture above. Favorable comment of many customers is fair testimony of the success of this installation.

● Data based on complete tests enable us to recommend exactly the right outlet for any condition and GUARANTEE results. You are assured of uniform, properly diffused air of the desired temperature at specified level, with required air movement and elimination of hot, cold, or drafty areas. Use ENGINEERED AIR DISTRIBUTION —see your Barber-Colman representative. *Photo by Hedrich-Blessing Studio*

venturi-flo
CEILING OUTLETS

BARBER-COLMAN COMPANY
1224 ROCK STREET • ROCKFORD, ILLINOIS

Getting Personal

G. S. Whittaker

G. S. "Jeff" Whittaker (co-author, *Heating, Ventilating, and Air Conditioning Problems in Airport Design*, page 67) was born in England but moved with his family to the province of Ontario, Canada, at a tender age. During the last war he worked under the Dominion Munitions Board on machinery design and special jigs and fixtures for one of Canada's principal munition makers. The rapid growth of Detroit's automobile industry after the war promised a wider scope for Jeff's talents and lured him across the border. By pure chance he met Saul Saulson, head of the mechanical department of Albert Kahn Associated Architects and Engineers, Inc., who were then as now up to their ears in post-war work. "Help me out in my department for the next three weeks while you look around for the job you want," suggested Saulson. Jeff agreed. That was in November, 1922. That three-weeks' temporary job will have reached the ripe old age of 23 years come next November, with not in that time a single break in Jeff's continuous service. Jeff specializes in heating, and the plans and specifications for such projects as Ford Willow Run, Chrysler Tank Arsenal, Dodge-Chicago and scores of others all cleared across his desk. He is a registered engineer in the State of Michigan and a member of the Detroit Engineering Society.

H. E. Ziel

Herbert E. Ziel (co-author, *Heating, Ventilating, and Air Conditioning Problems in Airport Design*, page 67) received his M.E. from Michigan State College in 1915 and has been with Albert Kahn Associated Architects and Engineers, Inc., for the past twenty-five years, in charge of air conditioning and ventilating.

Some of the larger air conditioning jobs designed by Mr. Ziel were the Ford Bomber, Pratt & Whitney-Kansas City and the Higgins Aircraft project at New Orleans. During the past five years a considerable amount of work has been done by Mr. Ziel on ventilating and air handling equipment for aviation engine testing. This work is still being carried on in connection with jet propulsion engines, gas turbines and compressors.

R. A. Wank

Roland A. Wank (co-author, *Heating, Ventilating, and Air Conditioning Problems in Airport Design*, page 67) is a native of Budapest and attended the Royal Polytechnicum, the College of Beaux Arts, and School of Applied Arts in that city and the Technical University at Brunn, Czecho-Slovakia. He came to the United States in 1924 and was naturalized six years later. Mr. Wank joined the Albert Kahn staff as chief designer early this year after more than ten years as head architect of the Tennessee Valley Authority. He was chief designer of the Grand Street apartments, New York City, and the Cincinnati Union Terminal, both of which received AIA gold medals. He is a member of AIA, American Institute of Planning Officials, National Planning Association, and National Association of Housing Officials.

H. D. Unwin

In July 1944 **Harry D. Unwin** (co-author, *Heating, Ventilating, and Air Conditioning Problems in Airport Design*, page 67) began a series of articles dealing with process piping in industrial plants, and because of their popularity will continue them in the near future. This same Harry Unwin now joins with three other specialists in the organization of Albert Kahn Associated Architects & Engineers, Inc., where for the past four years Mr. Unwin has been a member of the mechanical department, in the authorship of the special section on airports. Mr. Unwin received his M.E. degree from Cornell University in 1926 and spent his first year out of school with the gas distribution division of a California utility company. He then returned East and for the next fourteen years served as maintenance engineer, plant engineer and construction superintendent for various companies manufacturing linoleum, asphalt roofing, acoustical insulation and other building materials. This broad background of experience fitted him for the work of the Kahn organization where he is specializing on process piping.

Some of the projects which came under Mr. Unwin's supervision were the plans and specifications for the process piping at Ford Willow Run, Dodge-Chicago, and various foundries and forge plants for General Motors.

J. B. Skinner

John Brendan Skinner (co-author, *Ventilation Problems in Control of Heating and Humidity*, page 61) was born in Cambridge, Mass., and received his M.S. degree in chemical engineering in 1935. After wide experience as both chemical and civil engineer in private industry and government departments, he joined the Massachusetts Division of Occupational Hygiene in 1941. In 1943 he was placed in charge of engineering activities of the division and later the same year was placed in charge of technical activities principally concerned with industrial health hazards and their control by ventilation. He was commissioned by the U. S. Public Health Service in 1943 and placed on inactive duty.

W. MacL. Pierce

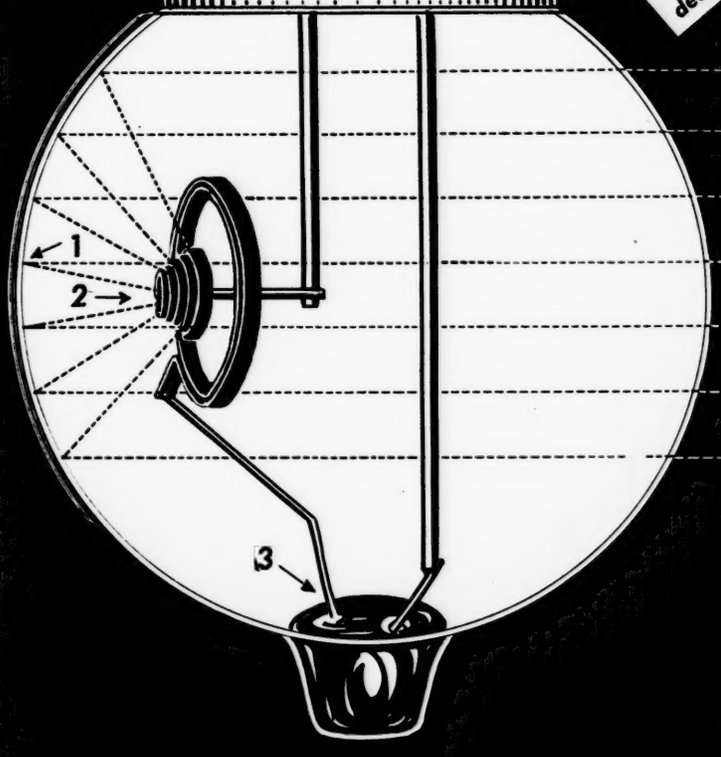
William MacLean Pierce (co-author, *Ventilation Problems in Control of Heat and Humidity*, page 61) was born in Massachusetts and took his bachelor's degree in chemistry at Tufts College in 1927. In 1935, he received his M.S. in Sanitary Engineering at Harvard. Until 1943 he was engaged in chemical and dust research for various private concerns when he was commissioned in the U. S. Public Health Service and assigned to the Massachusetts Division of Occupational Hygiene as an engineer. Mr. Pierce has done considerable work on a study of hot weather conditions in Massachusetts plants and on the engineering control of occupational disease hazards.

A WONDER
IN CONTROL PERFORMANCE
FOR DOMESTIC AND INDUSTRIAL OIL BURNERS

MERCOID VISAFLAME

A little thing in itself—but its size is a distinct advantage in modern oil burner design. It can be built into the burner unit

ACTUAL SIZE



(Actuated by the light of the flame)

NOTE THE SIMPLE OPERATION

1. *The light rays from the flame strike the concave mirror, where they are converged and reflected —*
2. *on the bimetal spiral, where in turn, the light waves are transmuted into heat which —*
3. *causes the bimetal to move the appended electrode into the mercury pool to close the circuit.*

The Visaflame closes its circuit in the presence of a flame and opens its circuit when the flame is absent.

Thousands are now in service.

The Visaflame Control System will make an ideal postwar set-up. Get the facts.

AN EXCLUSIVE MERCOID PRODUCT

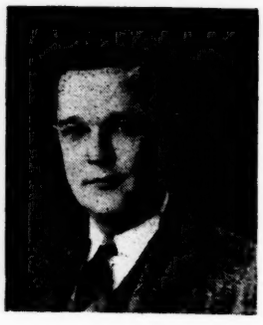
THE MERCOID CORPORATION, 4201 BELMONT AVE., CHICAGO 41, ILL.

Andrew D. Hosey (co-author, *Ventilation Problems in Control of Heat and Humidity*, page 61) was born in Phoebus, Va., and received his B.S. in chemical engineering in 1931 from the Virginia Polytechnic Institute. He was employed by the Virginia State Department of Agriculture as chemist from 1931 to 1941 and then transferred to the Bureau of Sanitary Engineering, Virginia State Department of Health. In 1943 he entered the reserve corps of the U. S. Public Health Service and was assigned to the Division of Industrial Hygiene in Boston. He was transferred to the Virginia Bureau of Industrial Hygiene in November, 1944, where he is now "selling" Virginia manufacturers on the importance of a well rounded industrial hygiene program.

A. D. Hosey

Charles F. Cushing (Heating Unit Apartments by Gas, page 88), at present distribution manager for the Bryant Heater Co., Cleveland, Ohio, was born in Towson, Md. He graduated with honors in mechanical engineering from The Johns Hopkins University, and received a B. S. degree.

He has been with Bryant since 1935 and prior to that was associated with Frigidaire Corp.



C. F. Cushing

Mr. Cushing is a member of the A.S.H.V.E., the American Gas Association; the Sales Executives Club and the Advertising Club of Cleveland. He has played a leading part in developing post-war sales techniques for utility companies, distributors and dealers.

He is an enthusiastic sportsman pilot and has run up better than 100 flying hours in his Ryan. Sailing and golf take up the rest of his spare time.

. . . Since the Last Issue

Thornton Lewis, 58, past-president of the ASHVE died suddenly July 4 at his home. Until recently Mr. Lewis had served as Chief of the Public Service Branch of the Army Service Forces, Washington, and previously he spent two years as Deputy Chief of the Procurement Service Branch, U. S. Army Ordnance Department.

Mr. Lewis graduated from the University of Kentucky in 1906, started his business career in the engineering department of Buffalo Forge Co., and for five years represented that company in New York. He went to Philadelphia and for two years was a member of the firm of Murphy and Lewis, specializing in drying and air conditioning systems. In the following 10 years he was a partner in the firm of Lewis, Robinson & Gant.

In 1921 Mr. Lewis became identified with the York Heating and Ventilating Corp. and later was its president and general manager. After merger with the Carrier Corporation, for six years Mr. Lewis served as executive vice-president and later became president of Pulp Products Co., New York. He retired from active business in 1937.

Mr. Lewis leaves a widow, three sons, and a daughter.

W. B. Connor Engineering Corp. has recently appointed the following to handle its line of adsorption equipment and diffusers: **W. Wallace Neale Co.**, Richmond, Va.; **D. R. Rippey**, Houston, Tex.; **Walter Cooke**, New Orleans, La.; **Joe P. Dillard**, Dallas, Tex.

Appointment of **Paul J. Moore** as motor sales manager of **Star Electric Motor Company**, Bloomfield, N. J., has been announced. Mr. Moore has been sales manager of Imperial Electric Co., Akron, since 1944 when he left the General Electric Co., Schenectady, after many years in the Motor Division. He is a graduate electrical engineer, Syracuse University, Class of 1923.

P. J. Moore

Harry A. Feldbush, formerly works manager of the Holyoke, Mass., plant of **Worthington Pump and Machinery Corp.**, has been named vice-president in charge of engineering for the entire corporation. His duties cover engineering activities of all works and domestic subsidiary companies. His headquarters will be at the general offices in Harrison, N. J. **Ralph M. Watson**, formerly chief engineer of the Centrifugal Engineering Division, has been appointed assistant to Mr. Feldbush.

The **American District Steam Co.**, North Tonawanda, N. Y., manufacturers of steam distribution equipment, announce the appointment of **Engineering Equipment Company**, 1532 Madison Road, Cincinnati 6, Ohio, as district representatives for Cincinnati and vicinity and of **Weeks Engineering Company**, 4526 Olive Street, St. Louis 8, Mo., as district representatives for Eastern Missouri and Southern Illinois.

Mario C. Giannini, associate professor of mechanical engineering in the College of Engineering of New York University, has been appointed director of the evening division of the College of Engineering. He will continue as a member of the engineering faculty at NYU and also serve as director of war training and veteran coordinator in the College of Engineering. He became a member of the University faculty in 1926.

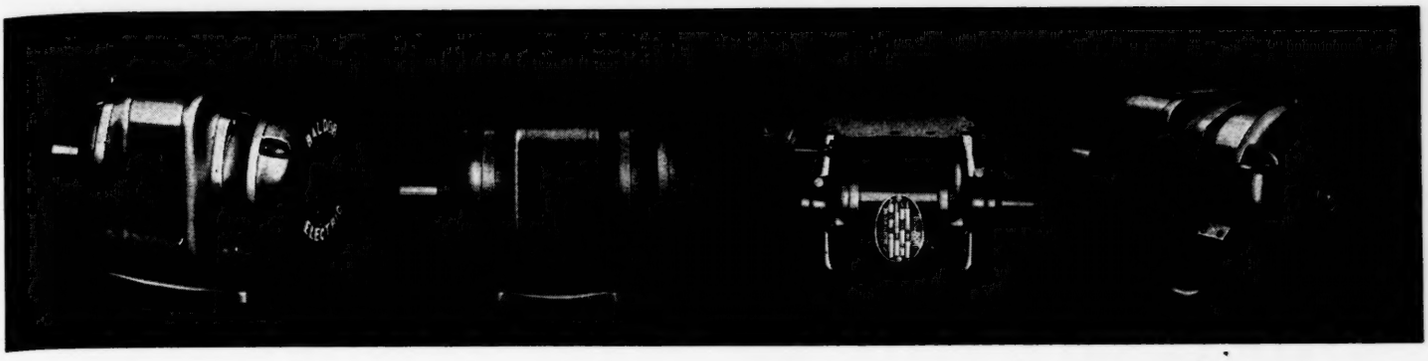
Professor Giannini has served as a consulting engineer in heating, air conditioning and mechanical equipment of buildings, and as a consultant to publishers on engineering and technical textbooks.

C. Emery Nelson, Inc., Minneapolis, Minn., has been appointed agent for **Kieley & Mueller, Inc.**, North Bergen, N. J.

Electric Air Heater Co. of Mishawaka, Indiana, makers of Electromode Electric Unit Heaters, has recently announced change of name to **Electromonde Corp.**

William B. Shirley has been appointed director of heating sales, **Airtemp Division, Chrysler Corporation**, and will make his headquarters in Dayton. For 20 years, Mr. Shirley has been connected with the Lennox Furnace Company, Marshalltown, Iowa. Starting as a field man with Lennox, he advanced to district manager, and after serving in various sections of the country, became General Sales Manager of the company. In 1940 he was chosen to organize the new Columbus manufacturing plant of Lennox and direct the sales activities of that division.

W. B. Shirley



BALDOR glass-insulated motors are used for all applications; especially recommended where limited space and weight is a factor.

BALDOR totally enclosed motors, **STREAMCOOLED DESIGN**, available in 1 ph., 3 ph. and D. C.

BALDOR fan and blower motors, gimbal-mounted, assure Quiet Operation.

Fully compensated D. C. motors; available in standard and low voltage for truck, railway and traction service.

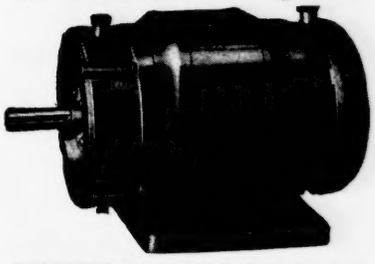
BALDOR face-mounted vertical motors; totally enclosed **STREAMCOOLED DESIGN**; 1 ph., 3 ph. and D. C.

BALDOR
BETTER MOTORS

Regardless of mechanical specifications and current characteristics required, Baldor is qualified by experience to handle your motor problems. The complete Baldor line includes all types of motors 1/20 to 20 H. P.

BALDOR ELECTRIC COMPANY, St. Louis 10, Mo.
District Offices in Principal Cities

25th YEAR of engineering service to motor buyers

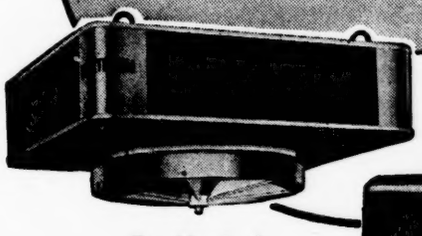


BALDOR face-mounted horizontal motors; totally enclosed, **STREAMCOOLED DESIGN**; 1 ph., 3 ph. and D. C.

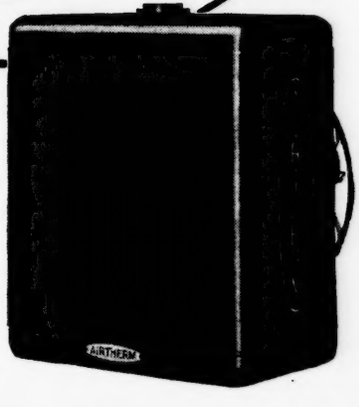
Save Fuel- Heat Uniformly, Efficiently

with

AIRTHERM
COPPER COIL, STEAM
UNIT HEATERS



For Vertical Delivery



For Horizontal Delivery

Airtherm Steam Unit Heaters are now equipped with copper coils for longer life, durability, and resistance to corrosion. They are individually controlled to afford you efficient, economical operation.

Deflectors are designed so that air velocities are increased without the necessity of extra power. Air is distributed evenly from the fans through the condenser eliminating "dead spots" and guaranteeing you full efficiency from every ounce of steam expended.

Let us show you, too, how Airtherm Unit Heaters can heat uniformly, efficiently, with a saving in fuel cost. Write today for bulletin showing detailed specifications on the complete line of Airtherm Unit Heaters.

AIRTHERM
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NOW is the Time to insulate DUCTS with DUX-SULATION

Insulate NOW with asbestos protected DUX-SULATION and save fuel for the next and all future HEATING SEASONS. DUX-SULATION puts the heat where you want it—creates a more even temperature throughout your building by preventing heat losses in your DUCT LINES.

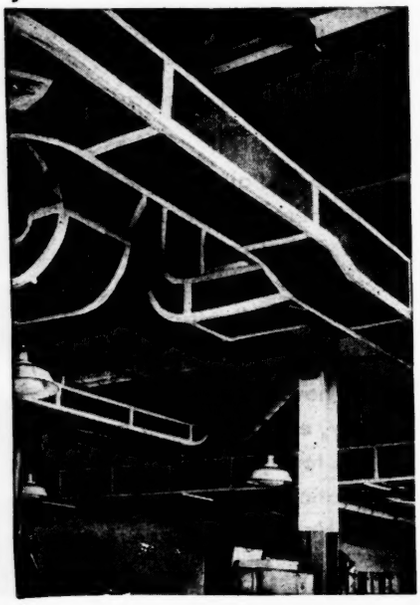
Government regulations require economizing on fuel this coming winter. Dux-Sulation covered metal ducts use less fuel to maintain desired temperatures and ideal working conditions.

Dux-Sulation not only saves fuel but deadens metallic sounds and quiets air borne noises.

Dux-Sulation can be applied to metal duct work without inconvenience—requires no maintenance and lasts indefinitely.

DUX-SULATION makes an attractive finished job and can be given any type of surface treatment.

Dux-Sulation is a flexible insulating blanket ½" thick having a K factor .27 B.T.U. Comes complete with corner and joint tape and special adhesive for cementing them on to sheet metal surfaces. Dux-Sulation is 36" wide. A roll contains 100 square feet. Dux-Sulation is easy to apply, easy to handle on the job, and easy to cut and fit.



Asbestos-protected Dux-Sulation is safe. Has low frictional resistance (f .0001322). Moisture proof surface. Mildew proof treated. Will not chip or flake.

Dux-Sulation comes complete, ready to apply. Nothing else to buy. No lugs, bolts or screws.

Write for Bulletin No. 407-V and actual sample of DUX-SULATION.

GRANT WILSON, INC.

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(22nd Floor, Board of Trade Bldg. . . Phone: Wabash 8220)

New assignments of duties in its Janitrol Aircraft Heater division are announced by **Surface Combustion Corp.**, Toledo, to meet increasing military demands for combustion type heaters. In a three-way shift, **J. W. Ashby** has returned to the Columbus, Ohio, plant of the company as manager of application engineering. Mr. Ashby has been serving as Pacific Coast manager of engineering of the aircraft division with headquarters in Los Angeles. Before the war, he was district manager of space heating for the company in the District of Columbia and Baltimore area.

J. W. Ashby

G. P. Mandel

B. M. Sharpe

Also returning to the Columbus plant from Los Angeles is **G. P. Mandel** where he was application engineer on aircraft heaters. In his new duties, he will work with Middle Western aircraft manufacturers on the application of Janitrol heaters to military vehicles and planes. **Burton M. Sharpe,** who has been in the aircraft heater design engineering division at Columbus as a project engineer is replacing Mr. Mandel as aircraft application engineer on the west coast.

Preparing for postwar sales, **Minneapolis-Honeywell Regulator Co.**, announced the reorganization of its heating controls division, and the appointment of six men to sales management capacities. **C. D. Lyford,** acting sales manager of gas controls, has been appointed sales manager of that department. **H. E. Chapler** has been named sales manager of oil controls with headquarters in New York. **C. C. Cochran** will direct heat control sales in the midwest, while **D. J. Peterson** has been made sales manager in the central zone with headquarters in Detroit. Both men will be assisted by **E. K. Scoggin,** named assistant sales manager of the heating controls division. **T. S. Carley,** formerly in Minneapolis, has been made assistant sales manager of Stoker controls with headquarters in San Francisco.

York-Shipley, Inc., introduces **Mr. E. T. Nahill** as a district manager for Pennsylvania, southern New Jersey, Maryland, Delmarva peninsula, District of Columbia and Virginia. Following his activity in the power control field, Mr. Nahill has been associated with the oil heating and air conditioning industry for the past nine years.

E. T. Nahill

Security Engineering Co., Inc., Whittier, Calif., will be acquired by **Dresser Industries, Inc.,** Cleveland, Ohio, according to a joint announcement by H. N. Mallon, president of Dresser and W. E. Seivers, executive vice-president of Security. The agreement has been signed by the officers of both companies but is subject to the approval of the Commissioner of Corporations of California and Security stockholders. Acquisition of the company will further round out the activities of the 13 Dresser member companies now serving the petroleum and gas industries.

Appointment of **Herbert B. Nottage** as research associate on the staff of the **ASHVE Research Laboratory** at Cleveland became effective July 1, according to Prof. G. L. Tuve, chairman of the committee on research. A graduate of the University of California, Mr. Nottage received his Bachelor's degree in Mechanical Engineering with honors in 1937 and his Master's degree in 1939. From 1939 to 1941 he was instructor in mechanical engineering at the Illinois Institute of Technology, and in August, 1941, he joined the research and development engineering staff of Pratt and Whitney Aircraft, East Hartford, Conn.

A. H. Heywood

Andrew H. Heywood has been appointed manager of the Motor Application Department of the **Westinghouse Electric Corp.**, East Pittsburgh, Pa. A native of Pownal, Maine, Mr. Heywood joined Westinghouse in 1926 after being graduated from Northeastern University, Boston, Mass. He served in Industrial Sales in Cincinnati, Ohio, for ten years, then engaged in Motor Division Sales activities until February, 1944, when he was appointed assistant manager of the department he will now head.

The **Spencer Heater Division of The Aviation Corp.** at Williamsport, Pa., has started on a program of plant improvement and rehabilitation in an effort to make it one of the most up to date foundries in the United States. Plans scheduled for completion in September call for the installation of a battery of three modern vertical core ovens; modern equipment for the cleaning of castings; automatic cupola charging equipment; overhead pouring conveyors; sand cleaning equipment and three power mold conveyors which necessitated the removal of 2574 cubic yards of earth for the construction of huge concrete pits.

The **A. F. Davis Welding Library** located at the Ohio State University, Columbus, Ohio, has copies of over 10,000 patents concerning welding equipment and the patented applications of welding to products or structures. The librarian would like to expand this feature of the collection. As soon as war conditions permit, the collection of books and papers from foreign countries will be increased.

Penn Electric Switch Co., Goshen, Ind., announces the appointment of three new branch managers and the opening of a new branch office in Milwaukee, Wis. **E. M. Smith**, formerly manager of the company's Detroit office, has been transferred to the home office and is

G. Orr Sanders

E. M. Smith

E. S. Kyle

manager of the Goshen factory sales branch covering northern Indiana, part of western Ohio and southwestern Michigan. **G. Orr Sanders** will succeed Mr. Smith as manager of Penn's Detroit office. **E. S. Kyle** will manage the company's new branch office which was established on July 15, at 1141 N. Van Buren St., Milwaukee.

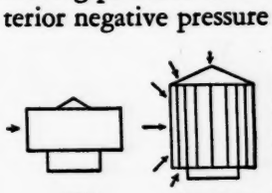
Positive Ventilation *without Down-Draft!*

Breidert Air-X-Hauster VENT FLUE CAP

The greatest scientific improvement in Ventilators in over 50 years

Ends annoyance and danger of pilot lights blown out by down-drafts.

No matter which way the wind blows, the revolutionary, aerodynamically correct design of the Breidert Air-X-Hauster enables it to provide safe, sure ventilation. No moving parts... "back-draft" eliminated where no interior negative pressure exists! • Unlike conventional ventilators, the Breidert has been thoroughly tested (by Smith, Emery & Co., Pacific Coast branch, Pittsburgh Testing Laboratories) with wind blowing at *all* angles, and its capacities *certified.*

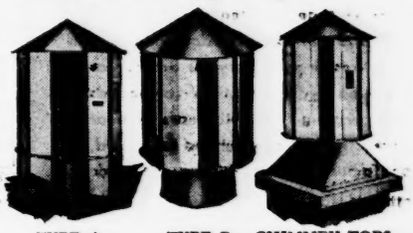


Old Method **Breidert Method**

THE ANSWER TO GAS HEATER PROBLEMS... The Breidert does not have the defects of conventional types of caps and accessories. It eliminates the necessity for down-draft diverters, with accompanying dangers of explosion in case unburned gas accumulates or is blown into the room.

Breidert Air-X-Hausters for Roofs and Chimney Tops

There is a Breidert Air-X-Hauster for practically every home, commercial and industrial ventilating problem. Thousands are successfully in use in all parts of the country.



TYPE A TYPE B CHIMNEY TOPS

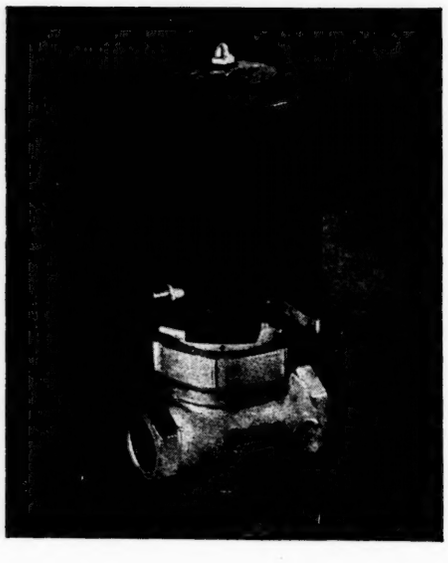
WRITE FOR FREE ENGINEERING DATA BOOK... contains specifications and installation data, certified capacity ratings, etc. Address Dept. R

G. C. BREIDERT CO.

634 South Spring Street, Los Angeles 14, California

REPRESENTATIVES LOCATED IN PRINCIPAL CITIES OF THE U. S.

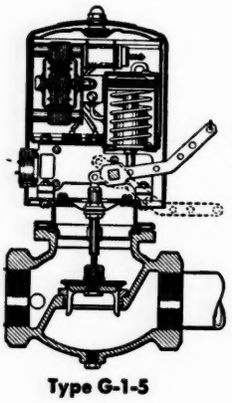
The Motor Valve with 3 "extras"



GENERAL CONTROLS
HYDRAMOTOR
GAS VALVE

1. Extra years of life.
2. Extra quick response.
3. Extra operating power.

The most powerful motor valve of its size ever designed. Simplicity and minimum friction insure years of extra life. Opens, 8 to 10 seconds. Closes, 2 to 3 seconds. Sizes, ¾" to 2½" I.P.S. Low or line voltage, all frequencies. Sealed in oil for life. Has ample damper power for louvres or secondary air doors. Motor driven hydraulic pump compounds high operating force. No gears to wear or lock. Highly recommended for mixed, manufactured or natural gases. Ask for further details.



Type G-1-5

GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIF.

FACTORY BRANCHES: PHILADELPHIA • ATLANTA • BOSTON • CHICAGO • DALLAS • KANSAS CITY • NEW YORK • DENVER DETROIT • CLEVELAND • PITTSBURGH • HOUSTON • SEATTLE SAN FRANCISCO • **DISTRIBUTORS IN PRINCIPAL CITIES**

K. E. Saboe

With plans for extensive coverage by St. Louis retail branch in the post-war stoker market, the **Iron Fireman Manufacturing Company** has appointed **Karl E. Saboe,** industrial sales manager in Cleveland for the last 10 years, as the branch's new manager. He has had 22 continuous years of experience with Iron Fireman, and was the first manager of the St. Louis branch in 1926, in charge of the merchandising and service operations of stoker equipment in that area. In 1930 he became a factory district representative, covering Michigan, northwestern Ohio and northern Indiana, until his transfer to Cleveland as industrial sales manager in 1936.

John de B. Shepard, for many years air conditioning engineer with Consolidated Gas and Electric Light and Power Company of Baltimore, and previously with Carrier Corporation, has become associated in consulting practice with **P. L. Davidson,** consulting engineer, with offices in New Hope, Pa., and Greenville, S. C. The firm specializes in textile humidifying and air conditioning.

In his connection with the Baltimore utility company Mr. Shepard was quite active as a member of and later chairman of the Technical Advisory Committee on Gas Summer Air Conditioning Research of the American Gas Association which published, in the fall of 1943, Research Bulletin No. 18, as the most complete assembly of information on gas air conditioning systems ever made available.

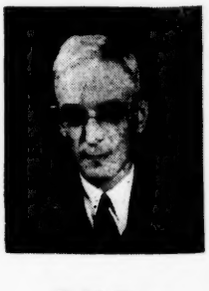
T. D. Slingman

T. D. Slingman has been appointed manager of industrial sales of **Baldwin-Hill Co.,** Trenton, N. J., manufacturers of thermal insulation products. Mr. Slingman was formerly vice-president of mechanical sales of The Dayton Rubber Mfg. Co. and had previously been associated with Fairbanks Morse Co., The Duriron Company and Chicago Pneumatic Tool Company.

K. E. Whitman, formerly division manager of Hall Manufacturing Company, Cedar Rapids, Ia., has become associated with **Schelm Brothers, Inc.,** East Peoria, Ill.

The company will maintain a Chicago Sales Office in the North Shore National Bank Building, 1737 Howard Street, Chicago, under the direction of Mr. Whitman.

Reliance Electric & Engineering Co. announces the appointment of two new distributors for Reliance products. **Standard Electric Motor Works** of Detroit will supplement the activity of the company's district office in the busy automotive center. In Milwaukee, the **C & G Sales & Engineering Co.** will extend the service of Reliance's Central Western Sales District.



D. M. Kagay

D. M. Kagay has been named sales manager of gas equipment for the heating division of **Gar Wood Industries, Inc.,** Detroit. Mr. Kagay had been the Gar Wood district representative in Michigan, Ohio, and Indiana from 1934 to 1942. During the past three years he was associated with a manufacturer of precision instruments for the Army and Navy.

Homestead Valve Manufacturing Co., Coraopolis, Pa., has appointed **Don H. Krey** as sales manager, and **Elliott G. Johnson** as assistant sales manager. Mr. Krey will direct all phases of the company's sales efforts and research; while Mr. Johnson will supervise all valve sales activities in addition to retaining his duties as director of advertising and public relations.

G. S. Crane

At the annual meeting of the board of directors of **Cutler-Hammer, Inc.**, held June 15, the management organization was broadened by the election of the following officers: F. R. Bacon, chairman of the board; H. F. Vogt, chairman of the executive committee; G. S. Crane, president; H. F. Vogt, vice-president and treasurer; and J. C. Wilson, vice-president and secretary.

The following additional officers were elected: P. B. Harwood, vice-president in charge of engineering; P. S. Jones, vice-president in charge of sales; Philip Ryan, vice-president in charge of manufacturing; E. W. Seeger, vice-president in charge of development and assistant secretary; M. R. Fenno, assistant treasurer; and J. C. Springer, assistant secretary.

William H. Kerr has become associated with the stoker division of the **A. O. Smith Corp.** as district representative in the Chicago market. Recently he was associated, as regional sales manager, with Holcomb & Hoke Mfg. Co. of Indianapolis, Ind. His earlier business career was spent in the securities and investment business, and with the Whiting Corp. in their stoker department as a district representative.

Merging of the **Williams Oil-O-Matic Heating Corp.** and **Eureka Vacuum Cleaner Co.** has taken place.

Both Oil-O-Matic and Eureka will continue with entirely separate, completely independent sales and merchandising set-ups. Product trademarks, too, will be carried as before. The Williams Oil-O-Matic Heating Corporation is now known as the Williams Oil-O-Matic Division of the Eureka Vacuum Cleaner Company.

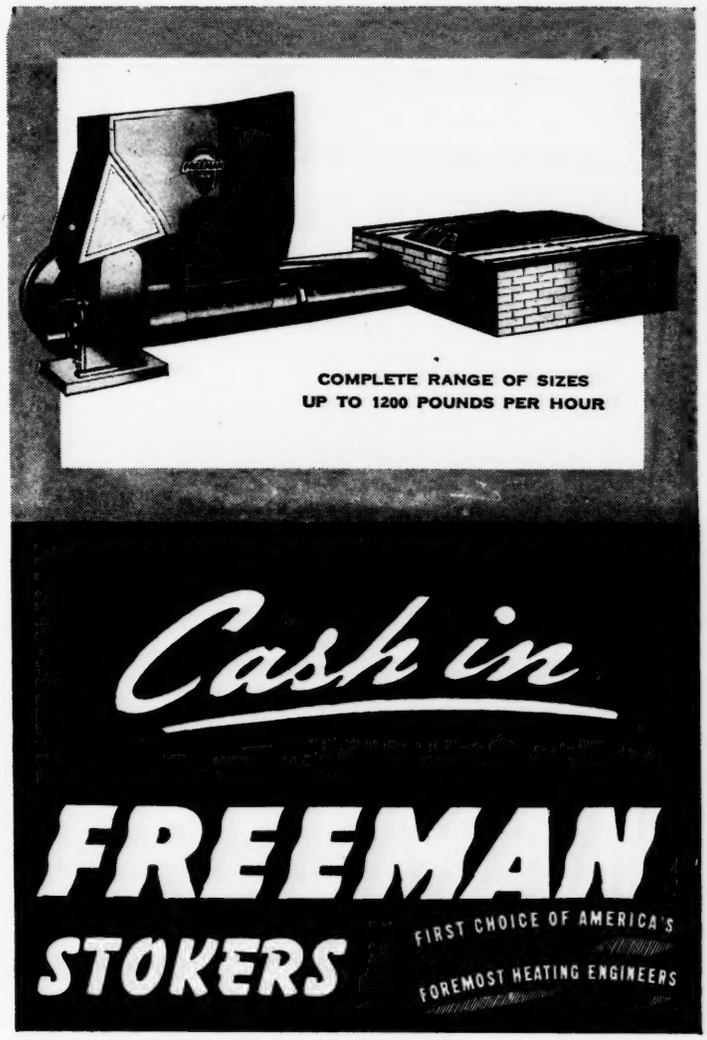
W. A. Matheson, president of the Williams Oil-O-Matic Heating Corporation becomes a vice-president and director of the Eureka Company, and manager of the Williams Oil-O-Matic Division. **Henry W. Burritt**, Eureka president since 1939, becomes president of the merged companies.

All of the directors and officers of the Williams Oil-O-Matic Heating Corporation, except Walter W. Williams, continue with Oil-O-Matic. Under terms of the merger, Mr. Williams, principal shareholder of Williams Oil-O-Matic, disposed of his entire interest in the company to Eureka.

O. E. Warring

Orville E. Warring has been appointed factory manager by **Illinois Iron & Bolt Co.**, Carpentersville, Ill. He will devote a considerable part of his time to production engineering on the company's post-war line of Freeman domestic, commercial, and industrial stokers.

He comes to his new position from Republic Air Craft Co., Detroit, where he was general superintendent in charge of manufacturing. Previously he held the same position with the Busch Sulzer Diesel Engine Co., St. Louis, Mo.; served as divisional factory manager of A. Y. McDonald Co., Dubuque, Ia., and was foundry engineer for Caterpillar Tractor Co., Peoria, Ill.



ADSCO HEAT EXCHANGERS

FOR HEATING . . .
Water for Washroom service ★ Water for process requirements ★ Water for space heating systems ★ Feed water ★ Water for swimming pools ★ Brine ★ Water for air conditioning ★ Fruit juices and other liquids ★ Molasses, oils, tars and other viscous liquids ★ Gasoline ★ Fuel Oil

FOR COOLING . . .
Condensate ★ Water for drinking water systems ★ Water for air conditioning ★ Quenching and cutting oils

FOR CONDENSING STEAM AND OTHER VAPORS

WRITE FOR QUOTATION

The above is only a partial list of uses for which ADSCO builds Heat Exchange Equipment. If the exact purpose for which you require such equipment is not listed, chances are ADSCO can build it. Write for quotation on the exact type of Heat Exchanger you require.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N. Y.
MAKERS OF "UP-TO-DATE" STEAM LINE EQUIPMENT FOR OVER 65 YEARS

A TYPE FOR EVERY PURPOSE

AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users — installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-616.

YARNALL-WARING COMPANY
104 MERMAID AVENUE
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YARWAY

Formation of a Distributors' Advisory Committee, representing 94 Herman Nelson Distributors operating in 125 cities in all parts of the country, has been announced by **Charles S. Stock,** general sales manager of **The Herman Nelson Corp.,** Moline, East Moline and Chicago, Ill., manufacturer of heating and ventilating equipment. Current problems and policies, common to both distributors and the corporation, will be discussed at meetings of the committee with Herman Nelson officials. Distributors represented by the new advisory committee at present employ 581 salesmen. Executives of five of the distributors, comprising the advisory committee, held their first meeting with Herman Nelson sales executives in Moline on June 25 and 26. Members of the Committee are Sydney Hart, president, International Engineering & Supply Co., Providence, R. I.; Hugh E. Oliphant, president, Tay-Holbrook, Inc., San Francisco, Calif.; Linn B. Kester, vice-president, Kester Machinery Co., Winston-Salem, N. C., and George P. Sherry, sales manager, Morrison Supply Co., Ft. Worth, Tex., Herman Nelson officials who outlined policies and discussed post-war plans with the committee were R. W. Nelson, vice-president; G. E. Otis, vice-president; Charles S. Stock, general sales manager, and Charles Wandas and Frank Tyler, product application engineers.

Seventeen professional and technical societies of the Kansas City area joined forces in establishing the **Technical Societies Council** for unified action in matters pertaining to the development of scientific endeavors.

At the organization dinner-meeting held in Kansas City July 9, **Dr. W. M. Hoehn,** member of the American Chemical Society and laboratory director of the George A. Breon & Co., was elected chairman; **C. M. Lytle,** Missouri Society of Professional Engineers, with the Kansas City Power & Light Co., vice-chairman; and **Charles Briggs,** member of the American Society of Mechanical Engineers, with the Burns & McDonnell Engineering Co., secretary-treasurer.

Each of the seventeen organizations elected two delegates to the Council. **D. M. Allen** and **J. M. Arthur** are delegates for **ASHVE;** and **A. C. Kirkwood** and **Charles Briggs** will represent **ASME. The Missouri Society of Professional Engineers** elected **C. M. Lytle** and **R. E. Welsh;** and **ASRE** elected **C. H. Garrison** and **E. G. Morgan.**

Charles A. Butcher, formerly manager of the Pacific Coast manufacturing and repair department of the Westinghouse Electric Corp., has been appointed assistant general manager of the **Crocker-Wheeler Division, Joshua Hendy Iron Works,** Ampere, N. J. Mr. Butcher is the author of several articles on automatic controls for power generation and on sub-station and distribution equipment. He is also the inventor of a number of devices and control systems related to automatic switch gear.

After 53 years of active service with **The Powers Regulator Company,** manufacturers of automatic temperature and humidity controllers and recorders, both **Fred W. Powers** of Chicago, Illinois, and his brother, **Donald J. Powers** of New York City, have retired from active duty.

Fred W. Powers, formerly president, is now chairman of the board of directors. Donald J. Powers, formerly vice-president, remains a director of the company.

H. C. Mueller of Chicago, associated with the company since 1926 and formerly general manager, has been elected president and general manager.

F. A. Murray of New York City was elected vice-president in charge of the Eastern Division, and **J. W. Powers** of Chicago was re-elected vice-president and is in charge of the Western Division.

Charles T. Blackmore of Chicago, former secretary, was elected secretary and treasurer, and **Henry Halterman** of New York City, assistant secretary.

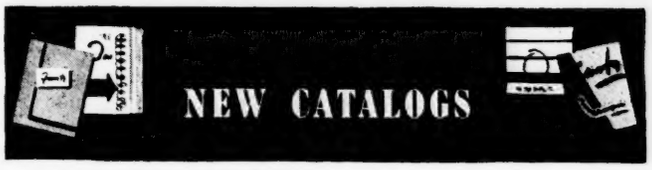
Two promotions in top personnel of the **Reliance Electric & Engineering Company** are announced. **Fred. E. Harrell,** chief engineer for the past two years, has been appointed general works manager, succeeding S. B. Taylor, who has resigned as manufacturing vice-president but will remain a member of the Board of Directors. **William R. Hough,** product development engineer, has been named chief engineer succeeding Harrell.

J. J. Anderson has been appointed assistant service manager of the Electric Appliance Division of the **Westinghouse Electric Corp.,** Mansfield, Ohio.

Mr. Anderson, with the exception of two years he served as an ordnance specialist, has been identified in the air conditioning and commercial refrigeration field with Westinghouse since 1937. He succeeds **J. A. Vassar** who was transferred to the Westinghouse Electric Supply Company.

The **Canton Stoker Corp.** of Canton, Ohio, has announced the appointment of **J. W. Miller, Jr.** as district manager of New York State with central offices located at 204 State Tower Building, Syracuse, N. Y. Prior to this appointment, Mr. Miller was working out of the Canton office as superintendent of government installations. **Mr. L. C. Dubs** has been elected vice-president and general manager of the corporation.

V. C. Kneese has been appointed manager of the Dallas factory branch of **General Controls Co.,** Glendale, Calif. Mr. Kneese has had over 10 years' experience as purchasing agent and accountant in the wholesale plumbing and hardware business and with Associated Mechanical Contractors.



Insulation

A new, 28-page industrial catalog—describing in detail various high and low temperature mineral wool insulations. The book is fully illustrated and complete with application specifications, and engineering data.—*Baldwin-Hill Co., 544 Klagg Ave., Trenton 2, N. J.*

Corrosion in Unit Heaters

Twelve-page booklet describing corrosion and its influence on unit heaters and their efficient operation. Contains technical information under various headings as what is corrosion, what prevents corrosion, what metals are vulnerable to corrosion. Contains illustrations of cast iron fin type unit heaters and installation views.—*D. J. Murray Manufacturing Co., Wausau, Wis.*

Refrigeration Units

Separate sheets present Worthington Freon-12 refrigeration unit specifications as follows: S type 3HS4 for use with shower condenser; S type 4HF6 for use with shower condenser; model CB-150-W water-cooled unit; model CB-75-W water-cooled unit; W type 3HS4 with water-cooled condenser.—*Worthington Pump & Machinery Corp., Harrison, N. J.*

Water Hose

A new catalog page on its line of water hose for industrial plants containing data on sizes, number of plies, weight per hundred feet, outside diameters and working pressures.—*The B. F. Goodrich Co., Akron, Ohio.*

Galvanized Pipe

●"IN the "Gal" Shop at WHEATLAND we give a bright and silvery face to black, homely pipe. First WHEATLAND pipe is automatically pickled by agitation, in a sulphuric acid bath, cleaning it of scale and other foreign matter. Then it is treated to a molten zinc soup, giving the pipe a heavy galvanized coating, in accordance with all Government specifications.

It's a specialized WHEATLAND job, to meet specialized qualifications, and the result is glittering pipe that retains its coating whether bent or formed, roughly handled, or given further hard trial."

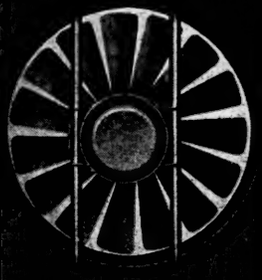
Plant: Wheatland, Mercer County, Pa.
General Offices: Real Estate Trust Building
Philadelphia 7, Pa.

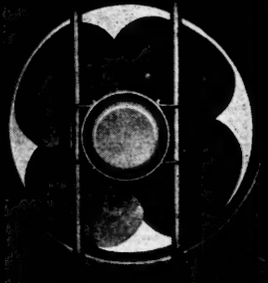
WHEATLAND TUBE COMPANY

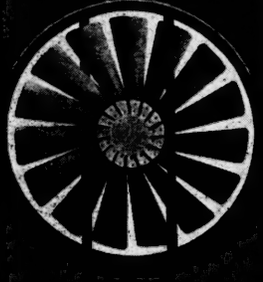
FOR FAST, QUIET AIR MOVEMENT INSTALL

Peerless Electric

PROPELLER FANS



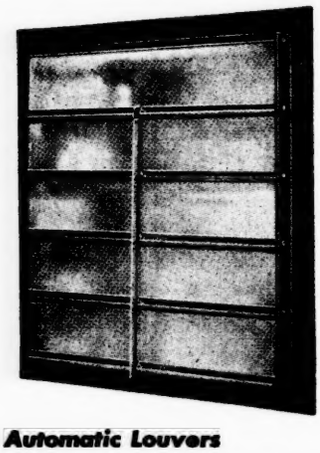




NO matter what your need for quiet, variable speed, attractively designed fans, you'll find the answer in a Peerless Electric design.

A combination of specially engineered capacitor motors and perfectly balanced extra wide blades produces extremely quiet operation. Motors are totally enclosed and permit installation in either a vertical or horizontal position.

These fans are supplied in single-speed, two-speed or three-speed operation and finished in gray. Recommended for stores, restaurants, hotels, offices and similar installations where quietness of operation and attractive appearance are prime requisites. Write for descriptive folders.



Automatic Louvers

Peerless Electric automatic louvers are designed especially for use with propeller fans. When the fan starts, the air stream instantly opens the louvers, which close by gravity when the fan stops. Completely weatherstripped around the inner edge of the frame. Built of high grade aluminum. Sizes from 10 to 48 inches.

For production achievement

THE Peerless Electric COMPANY
WARREN, OHIO
Established 1893

Heat Exchanger

Bulletin H-1 (5th Edition) covers instantaneous and storage hot water generators, closed heat exchangers and converters, open heat exchangers. Heating capacities of regular models range from 60 to 4,400 gph; storage capacities, 25 to 1,904 gal.—*The Brownell Company, 410 N. Findlay St., Dayton 1, Ohio.*

Gas Flow Control

A new bulletin describing the operation and characteristics of the company's Type SO Regulator for the control of suction, pressure or flow in any gas or air flow system. A feature of this Bulletin 1145 is a cutaway wash drawing of the regulator in four colors that shows its operation clearly.—*Hagan Corp., Pittsburgh, Pa.*

Centrifugal Pumps and Impellers

"Facts You Should Know About Centrifugal Pumps and Impellers," a 20-page illustrated booklet. Gives a number of basic facts of interest to engineers. Information i applicable to all makes of centrifugal pumps.—*The Deming Co., Salem, Ohio.*

Powder Metal Parts Design

A 56-page book described as an engineering manual entitled "Durex Self-Lubricating Bearings and Structural Parts" covers powder metal parts design on the basis of practical usefulness to engineers, designers, and manufacturers. Illustrated with photographs and diagrams, the subject matter is logically divided to give a general as well as a detailed presentation of the applications of powder metallurgy to small parts. — *Morain Products Division, General Motors Corp., Dayton 1, Ohio.*

Correct Heating System

In a 22-page booklet written for the layman is described the various forms of heating system, and the many ways for distributing heat. It provides the home planner with a general concept of what is available in home heating.—*The National Radiator Co., Johnstown, Pa.*

Pump Engineering Data

A cloth-bound manual consisting of 416 pages of thoroughly indexed data on pumps of all types as well as handbook tables on other phases of fluid handling such as friction loss in pipes, weir construction, nozzles, etc. This book is liberally illustrated with photographs of typical installations and various pump types as well as scale drawings and charts. An introductory section outlines the principles of pump engineering. For convenient reference, the table of contents is keyed to a thumb index marking the various sections, while the entire subject matter is covered by an alphabetical index in the back of the book.—*Economy Pumps, Inc., Hamilton, O.*

Bearings

Illustrated folder on Morganite, self-lubricating bearings. Table gives physical and mechanical properties of various grades.—*Morganite Brush Co., Inc., Long Island City 1, N. Y.*

Gas Control System Service Manual

A 42-page manual for the utility, installation and service man interested in the B-60 control system. General instructions on installation, service troubles and remedies, maintenance and repairs, removal, disassembly, inspection, adjustment, and test procedure are given in this handbook (FI-101) covering the Pilot Generator, the B-60 Gas Valve, and T-80 Thermostats. A parts catalog section contains a list and illustrations of all purchasable parts for B-60 Gas Control Valves.—*General Controls Co., 801 Allen Ave., Glendale 1, Calif.*

Electrical and Automotive Parts

A 16-page folder (form GU-86) describing briefly an entire line of electrical and automotive products: motors, transformers, industrial brakes and controls, hydraulic brakes, air brakes, tachographs (speed-recording speedometers), NoRoL, brake lining, and brake-service tools. Also included are pictures and addresses of 29 sales and service offices and an airplane view of the factory.—*Wagner Electric Corporation, 6463 Plymouth Avenue, St. Louis 14, Mo.*

Turbine and Propeller Pumps

Two bulletins known as Publications AQB400.1 and AQB500.1 describe the Fairbanks-Morse Figure 6920 oil lubricated turbine pump and the large capacity line of Fairbanks-Morse Niagara Propeller pumps, respectively. —*Fairbanks-Morse & Co., Chicago 5, Ill.*

Gas Heating Controls

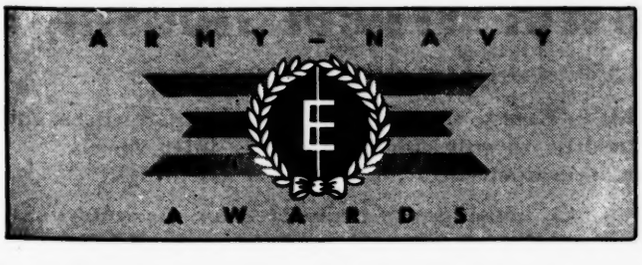
A 29-page service and instruction manual on Automatic Gas Heating Controls. Describes and illustrates the various types of controls, lists the possible troubles, the causes for the troubles and shows how the conditions can be corrected. Installation data included.—*General Controls Co., 801 Allen Ave., Glendale 1, Calif.*

Refrigeration Compressor Series

A series of bulletins describing refrigeration compressors and evaporative coolers of various types. These bulletins are complete with illustrations and technical data.—*Worthington Pump & Machinery Corp., Refrigeration Div., Harrison, N. J.*

INDUSTRIAL DEGREE-DAYS
June, 1945

City	55F Base	45F Base
Baltimore, Md.	0	0
Buffalo, N. Y.	49	4
Chicago, Ill.	28	1
Cleveland, Ohio	23	0
Detroit, Michigan	31	0
Indianapolis, Ind.	12	0
New York, N. Y.	12	0
Philadelphia, Pa.	4	0
Pittsburgh, Pa.	17	0
St. Louis, Mo.	0	0



U. S. Radiator Corp. (West Newton, Pa., plant)

Williams Oil-O-Matic Div., Eureka Vacuum Cleaner Co., Bloomington, Ill. (Fifth award)

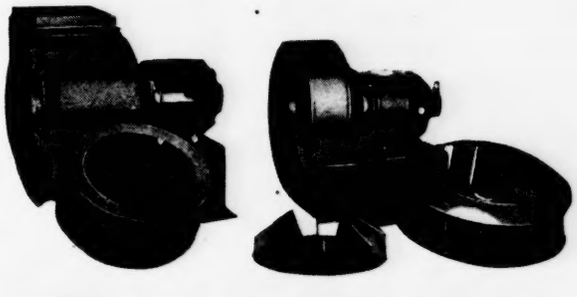
The Herman Nelson Corp., Moline, Ill. (Fourth award)

Climate

AS YOU LIKE IT

That's the story behind Johnson's Health-aire propeller fans and blowers. The cumulative "know-how" growing out of more than twenty-five years of constant research and experiment back every one of these products.

Johnson Health-aire Propeller Fans and Blowers of various types are now available for industrial and commercial users. Let a Johnson engineer help you solve your ventilating problems . . . his counsel is available to you at all times.



Healthaire

JOHNSON FAN & BLOWER CORP.

1319 W. Lake St. Chicago 7, Illinois